

NOTES ON THE ASTRONIEAE (MELASTOMATACEAE) - I. ASTROCALYX, ASTRONIA

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SUMMARY

The Astronieae (Melastomataceae) occur in Southeast Asia and include *Astrocalyx* Merr., *Astronia* Blume, *Astronidium* A. Gray, and *Beccarianthus* Cogn. *Astrocalyx* has 1 species, *Astronia* has 2 sections (1 new) with 59 species (28 new, 7 new varieties, 5 as new combinations, 1 new name).

INTRODUCTION

The Astronieae were first distinguished by Decaisne (1846) as a subfamily ('sous-ordre') and included *Astronia* Blume, *Ewyckia* Blume, and *Kibessia* DC. Naudin (1852) retained in the 'subordo Astronieae' only *Astronia* Blume, including the pre-Linnaean *Pharmacum* Rumph. (1750) and *Conostegia glabra* (G. Forst.) D. Don ex DC. He moved *Ewyckia* and *Kibessia* to the 'subordo Kibessieae'. These genera are now regarded as part of the genus *Pternandra* Jack (Maxwell, 1981), which presently is the only genus in the tribe Kibessieae.

Triana (1866) reduced Decaisne's subfamily to the tribe Astronieae and included *Astronia*, *Pternandra* (incl. *Ewyckia*, *Macroplacis* Blume, *Rectomitra* Blume), *Astronidium*, *Kibessia*, and *Naudinia* Decne. ex Seemann (the latter name may be regarded as validly published here as well, but probably later than Seemann's *Flora Vitien-sis* of January 1866).

Baillon (1877) regarded the Astronieae as a 'series' including *Astronia*, *Plethiandra* Hook. f., and *Pternandra*.

Cogniaux (1890, 1891), the most recent monographer of the whole family, broadened the concept again and included *Astronia*, *Beccarianthus* Cogn., *Kibessia*, *Plethiandra*, and *Pternandra*. Schumann and Lauterbach (1900) added *Bamlera*, Merrill in 1910 *Astrocalyx* and in 1913, in his important revision of the Astronieae for the Philippines, *Everettia*. Mansfeld (1925) revising the group for German New Guinea added *Creochiton* Blume formerly included in the Dissochaeteae (Naud.) Triana to the present tribe, but Bakhuizen f. in his revision of the family for Indonesia (1943) excluded it again, creating the subtribe *Creochitoninae* (Miq.) Bakh. f. in the Astronieae for it. This one is much closer to the Dissochaeteae, though, where it is either part of the Dissochaetinae (Maxwell, 1984), or a subtribe of its own (Veldkamp, 1978).

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Astronidium A. Gray (1853, 1854) and *Naudinia* Decne. ex Seemann (1866) non A. Rich. (1846), or *Naudiniella* Krasser (1893), complete the list of genera which at one time or the other were included in the Astronieae. *Lomanodia* Raf., *Naudinia*, and *Naudiniella* are homotypic. The latter two names are therefore superfluous, while *Lomanodia* itself has been rejected (Veldkamp, 1983); *Naudinia* is moreover a later homonym. See also the further remarks under *Astronidium*.

Astronidium and *Naudinia* were included in *Astronia* as a section *Astronidium* and a subgenus *Naudinia*, respectively, by Triana (1871) until Markgraf (1934) revived *Astronidium* in which he included *Naudiniella*.

As we presently understand the tribe, the Astronieae include four genera: *Astronia*, *Astronidium*, *Astrocalyx*, and *Beccarianthus*.

Plethiandra is a member of the Dissochaeteae subtribe Medinillinae (Maxwell, 1983), while *Bamlera* and *Everettia* have here been reduced to *Beccarianthus*.

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ASTRONIEAE

Astronieae (Decne.) Triana, Bull. Congr. Bot., Amsterdam 1865 (1866) 457; Trans. Linn. Soc., London, 28 (1871) 151; Cogn. in DC., Monogr. Phan. 7 (1891) 1092; Krasser in E. & P., Nat. Pfl. Fam. III, 7 (1893) 143, 194; Bakh. f., Thesis (1943) 296. — *Astronioideae* Decne., Ann. Sc. Nat. III, 5 (1846) 312 ('subordo *Astronieae*'); Naud., Ann. Sc. Nat. III, 12 (1849) 201 (id.); Naud., Ann. Sc. Nat. III, 18 (1852) 257 (id.). — Type: *Astronia* Blume.

Treelets or trees, sometimes shrubs, branching sympodially, usually lepidote. *Leaf blades* usually plinerved with additional inframarginal basal nerves. *Inflorescence* usually terminal, paniculate, usually many-flowered. *Flowers* staminate and/or bisexual, 4–8-merous. *Calyx* with distinct, equal, usually symmetric lobes, or splitting irregularly. *Stamens* equal or subequal, usually twice as many as the petals, many in *Astrocalyx* Merr. Anthers spurred or not, locules and connectives various. Style and stigma sometimes rudimentary in staminate flowers, always well-developed in bisexual ones. *Ovary* 2–9-locular, usually with 2, 5 or 6 locules. *Placenta* basal, cushion-shaped or ascending. *Fruits* capsular. *Seeds* usually cuneate, apex flat, sometimes narrowly linear.

Distribution. Andaman & Nicobar Islands to Taiwan, Malesia, Marianas to Vanuatu and Tahiti. It is very remarkable that there seem to be no species in Australia, not even in the tropical rain forests of Queensland, while there are so many in New Guinea, Solomon Islands, and Vanuatu. As *Memecylon* L. and *Pternandra* Jack have been found in the Cape York Peninsula, some *Astronieae* may well occur there, too.

KEY TO THE GENERA

- 1a. Flowers bisexual. Stigma not capitate, i.e. at most slightly thicker than the style. Placentae erect and ascending 2
- b. Flowers androdioecious. Bisexual flowers with a capitate stigma, 0.75–1.25 mm diam., in staminate flowers capitate or not. Placentae cushion-shaped, not erect or ascending **Astronia**
- 2a. Calyx and capsule lobes usually not laterally flattened, if so, symmetric. Stamens 8–16 3
- b. Calyx and capsule lobes laterally flattened, asymmetric. Stamens many (c. 55–65). — Philippines **Astrocalyx**
- 3a. Anthers with a posterior spur. — New Guinea to the Pacific (Society Islands) **Astronidium**
- b. Anthers without a posterior spur. — Borneo, Philippines, New Guinea **Beccarianthus**

SURVEY OF THE TAXA

ASTROCALYX

Astrocalyx Merr., Philip. J. Sc., Bot. 5 (1910) 203. — T y p e: *Astrocalyx pleiosandra* Merr. [= *Astrocalyx calycina* (Vidal) Merr.].

1. *Astrocalyx calycina* (Vidal) Merr.

Astrocalyx calycina Merr., Philip. J. Sc., Bot. 8 (1913) 335, t. 11. — *Astronia calycina* Vidal, Rev. Pl. Vasc. Filip. (1866) 136. — *Pharmacum calycinum* O. Ktze, Rev. Gen. Pl. 3 (1898) 954. — T y p e: Vidal 780 ('781') (PNH, holo, not extant; A, K, L), Philippines, Luzon, Albay, Mt Bulusan.

Astrocalyx pleiosandra Merr., Philip. J. Sc., Bot. 5 (1910) 203. — T y p e: *FB 14349-bis* (Aguilar) (PNH, holo, not extant), Philippines, Luzon, Camarines, near Daet, July 1909.

D i s t r i b u t i o n. Philippines: Luzon, Catanduanes, Samar, Leyte, Mindanao.

H a b i t a t. Primary forests, often in damp areas; 550–1700 m.

ASTRONIA

Astronia Blume, Bijdr. 17 (1826) 1080. — *Astronia* subg. & sect. *Euastronia* Triana, Trans. Linn. Soc., London 28 (1871) 151; Cogn. in DC., Monogr. Phan. 7 (1891) 1093; nom. inval. — *Pharmacum* Rumph. [Hb. Amb. 4 (1750) 134, t. 69.] ex O. Ktze, Rev. Gen. Pl. 1 (1891) 247; 3 (1898) 953; nom. superfl. — L e c t o t y p e: *Astronia spectabilis* Blume [= *Pharmacum spectabile* (Blume) O. Ktze] (here appointed).

N o t e s. The Index Kewensis gives Noroña as the author of *Astronia* (Verh. Bat. Gen. 5, 1790, 1), but there it is a nomen nudum, and, if the vernacular name 'camuning' is to be believed, it is identical with *Murraya paniculata* (L.) Jack (Rutaceae; cf. Heyne, 1950; Van Steenis & Van Steenis-Kruseman, 1970: 359).

Although it is known that Blume had apparently access to Noroña's lost papers (see Veldkamp & De Laubenfels, 1984: 340), he did not refer to the source of the name *Astronia*, neither in print, nor on his labels.

Kuntze (1891) regarded *Astronia* Blume as a later homonym of *Astronium* Jacq. (1760, Anacardiaceae) and used *Pharmacum*, a name proposed by Rumphius for it (1750). Under the present rules this is incorrect (Art. 64, Ex. 9: this is a similar case as *Peponia* and *Peponium*). Kuntze may have been unaware of *Astronidium* A. Gray (1853), although he included its type species, *A. parviflorum* A. Gray, but would have regarded that name as a later synonym of Rumphius's, anyway. As it is, his action is inadmissible under the present rules, and *Pharmacum* O. Ktze is a superfluous name, homotypic with *Astronia*.

Triana (1871) originally included 12 species in *Astronia* subg. '*Euastronia*' (nom. inval. = *Astronia*) which had regular 4- or 5-dentate calyces and 4 species in subg. *Naudinia* for the species with calyprate or irregularly 3–5-lobed calyces. Cogniaux (1891) included some more species modifying '*Euastronia*' to include 19 species which have calyces with 4–10 teeth or lobes.

All species of subgenus *Naudinia* and some of '*Euastronia*' were included in *Astronidium* by Markgraf (1934). It became quite apparent that the characters of the calyx were not the only delimitative features in the taxonomy of the tribe. Section *Astronia* ought to be redefined and a new one erected, as is shown in the following key:

KEY TO THE SECTIONS OF ASTRONIA

Of some taxa only the staminate or the bisexual flowers are known. Obviously after lead 11 of the key to the species these have been included under the known phase only.

Staminate flowers are known only of *Astronia acuminatissima* Merr. var. *palawensis* Maxw., *A. alata* Maxw., *A. apoensis* Elmer, *A. chartacea* Maxw., *A. dioica* Merr., *A. elaterinervis* Maxw., *A. gitingensis* Elmer, *A. grandiflora* Maxw., *A. klabaensis* Maxw., *A. lagunensis* Merr. var. *pauciflora* (Merr.) Maxw., *A. rugata* Maxw., *A. scabrida* Maxw., *A. shungolensis* Maxw., *A. squamosa* Maxw., *A. truncata* Maxw., *A. villosa-vaginata* Maxw.

Only capsules are known of *A. benguetensis* Maxw.

Remarks after a '—' are valid for the particular lead only, they are various or unknown in the opposing one and intended as additional help in identification.

- 1a. Staminate flowers with the style exerted from the calyx tube, and stigma \pm subglobose, 1–1.5 mm diam. — Ovary and capsule 2–5-locular. Mainly E Malesia to New Britain and New Ireland. (Spp. 1–36) Section **Astronia**
- b. Staminate flowers usually without a style, or, when present, then usually as a poorly developed one, shorter than the calyx tube, and without a stigma. — Ovary and capsule 2-locular. Andaman & Nicobar Islands, Burma, Malaya, Borneo, the Philippines, Taiwan. (Spp. 37–59) Section **Astigmata**

KEY TO THE SPECIES OF ASTRONIA

- 1a. Midrib of leaf blade with 1–3 pairs of prominent nerves at or near the base besides a weaker inframarginal pair 2
- b. Midrib of leaf blade without a pair of prominent nerves at or near the base, only with a weak inframarginal pair 14. *A. elaterinervis*
- 2a. Flowers 5-merous, rarely 4- (sometimes in *A. atroviridis*) or 6-merous (sometimes in *A. crassiloba*, *A. formosana*), then not from the Philippines. (N.B.: The number of locules in the ovary and fruit does not necessarily correspond with the merousness of the flower!) 3
- b. Flowers 4-merous. — Philippines 49b. *A. lagunensis* var. *pachyphylla*
- 3a. Indument on either the branchlets and inflorescence or infructescence axes, or the petioles mixed with echinate or squamose, 0.75–3 mm long appendages 4
- b. Indument sometimes mixed with setaceous, but not echinate or squamose appendages 8
- 4a. Male flowers with a well-developed capitate stigma. — Female flowers with 3-locular ovaries. New Guinea 5
- b. Male flowers without a developed stigma. — Female flowers with 2-locular ovaries. Philippines 6
- 5a. Indument of branchlets and especially of the inflorescence axes floccose with erect to spreading, furfuraceous and barbed, up to 1 mm long bristles
17. *A. grandiflora*
- b. Indument of branchlets and inflorescence axes usually with erect to spreading bristles 29. *A. shungolensis*
- 6a. Branchlets obscurely quadrangular to terete, up to 7 mm diam. Leaf blades 3.5–20 by 2–9 cm, with one pair of basal nerves, indument with large scales . . . 7
- b. Branchlets acutely quadrangular, 8–10 mm diam. Leaf blades 24–30 by 13–14 cm, with 3 pairs of basal nerves, indument echinate . . . 39. *A. apoensis*
- 7a. Petioles 2–6.5 cm long by 1.5–5 mm diam., usually with dense large scales. Leaf blades (7–)9–20.5 by 4–9 cm 49a. *A. lagunensis* var. *lagunensis*
- b. Petioles 1–3 cm long by 1–2 mm diam., without large scales. Leaf blades 3.5–10 by 2–3.5 cm 49c. *A. lagunensis* var. *pauciflora*
- 8a. Branchlets up to 8 mm diam., these and the axes of the inflorescences or infructescences terete, or flattened, or obtusely to acutely quadrangular, rarely 4-winged (if 8–10 mm, then leaf blades with 2 pairs of nerves at the base, scabrous underneath: *A. scabrida*) 9
- b. Branchlets 8–12 mm diam., these and the axes of the inflorescences or infructescences acutely quadrangular to 4-winged. — Leaf blade with 1 pair of nerves 5–9 mm above the base, underneath smooth 38. *A. alata*
- 9a. Petioles narrowly to broadly winged for their entire length by the acute or decurrent leaf bases 10
- b. Petioles not narrowly to broadly winged for their entire length by the decurrent leaf bases, usually angular or terete 11
- 10a. Branchlets terete. Leaf base decurrent. — Philippines 43. *A. dioica*
- b. Branchlets acutely quadrangular. Leaf base acute, not decurrent. — New Guinea 10. *A. coriacea*

- 11a. Flowers staminate 12
- b. Flowers bisexual 58
- 12a. Style and stigma developed, sometimes rudimentary, always more than 1 mm long. Ovary absent 13
- b. Stigma, style, and ovary absent (pistillode rarely up to 1 mm long) 38
- 13a. Calyx margin, at least when mature, truncate with very broad and inconspicuous lobes or cusps and obscure sinuses 14
- b. Calyx margin especially in bud with distinct lobes or cusps at least 0.2 mm long, sinuses distinct 15
- 14a. Calyx tube c. 1 mm long. Petals c. 1.5 by 1.5 mm. Anthers with an obtuse posterior appendage. — Celebes **19. A. klabatensis**
- b. Calyx tube c. 2 mm long. Petals c. 4 by 4 mm. Anthers with a thin posterior, hook-like appendage. — New Guinea **35. A. truncata**
- 15a. Calyx lobes very thick, much more so than the tube. 16
- b. Calyx lobes about as thick as the tube 19
- 16a. Leaf blades with a pair of lateral nerves at some distance above the base of the midrib, lower surface densely furfuraceous lepidote 17
- b. Leaf blades with a pair of nerves at the base of the midrib, lower surface glabrous or nearly so 18
- 17a. Leaf blades dark brown pubescent beneath, apex with inrolled margins. Calyx tube c. 2.5 mm long, lobes c. 0.75 mm long **2. A. arborea**
- b. Leaf blades pale brown pubescent beneath, apex with flat margins. Calyx tube c. 3 mm long, lobes c. 0.5 mm long **12. A. crassiloba**
- 18a. Petioles c. 4 mm diam., shallowly grooved, sparsely furfuraceous. Leaf blades 16–34 by 8–14.5 cm. Calyx c. 3.5 mm long, tube without longitudinal ridges and grooves (i.s.) **30. A. sorongensis**
- b. Petioles c. 2 mm diam., with a pale brown, densely villous and vaginate dorsal groove. Leaf blades 12–23 by 4.5–10 cm. Calyx 2–2.25 mm long, tube with 10 longitudinal ridges and grooves (i.s.) **36. A. villosa-vaginata**
- 19a. Branchlets, petioles, and lower surface of the leaf blades ± glabrous 20
- b. Branchlets, petioles, and lower surface of the leaf blades moderately to densely furfuraceous lepidote, glabrescent, often appressed and wax-like 21
- 20a. Calyx lobes smooth **18. A. hollrungii**
- b. Calyx lobes rugose **26. A. rugata**
- 21a. Calyx margin ± truncate, or with inconspicuous lobes, or with minute cusps up to 0.25 mm long 22
- b. Calyx lobes distinct, 0.5–1.5 mm long 24
- 22a. Calyx tube without longitudinal ridges and grooves (i.s.). — Celebes to New Guinea 23
- b. Calyx tube with 10 longitudinal ridges and grooves (i.s.). Nicobar & Andaman Islands to Borneo **22. A. macrophylla**
- 23a. Calyx tube c. 2 mm long, lobes broadly rounded, cuspidate **1. A. angustifolia**
- b. Calyx tube c. 1 mm long, lobes at first triangular, obtuse, later truncate, minutely cuspidate **19. A. klabatensis**
- 24a. Leaf blades subcoriaceous to coriaceous 25
- b. Leaf blades chartaceous **8. A. chartacea**

- 25a. Calyx lobes broadly rounded, cuspidate 26
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 b. Branchlets 5–6 mm diam., usually glabrous. Petioles usually winged, 2–6 cm long. Leaf blades 10–27.5 by 3–12 cm 10. *A. coriacea*
- 28a. Indument appressed, furfuraceous lepidote 3. *A. atro-viridis*
 b. Indument flaking, of large and small scales 32. *A. squamosa*
- 29a. Indument appressed to spreading, coppery to brown, furfuraceous lepidote. Calyx densely furfuraceous 30
 b. Indument appressed, silvery grey to tan lepidote, especially on the lower surface of leaf blades. Calyx sparsely lepidote, nearly glabrous 28. *A. sericea*
- 30a. Leaf blades underneath persistently densely furfuraceous lepidote, apex cuspidate to rostrate, or bluntly acute at the tip 31
 b. Leaf blades underneath glabrescent, sparsely furfuraceous to \pm glabrous at maturity, apex obtuse to bluntly acute 1. *A. angustifolia*
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- 35a. Branchlets quadrangular, 3–7 mm diam. Leaf blades underneath coppery to brown pubescent, the secondary venation not obscured 36
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- 37a. Leaf blades underneath appressed lepidote, margins distally revolute. Calyx tube c. 1.75 mm long, lobes 0.5–0.75 mm long 6. *A. brunneo-aenea*
 b. Leaf blades underneath furfuraceous, margins distally flat. Calyx tube 2–2.25 mm long, lobes 0.75–1 mm long 21. *A. ledermannii*

- 38a. (12). Stamens subequal, the oppositipetalous ones larger than the others (check mature buds) 39
- b. Stamens equal (\pm equal in *A. sabahensis*!) 56
- 39a. Calyx lobes 0.75–1.5 mm long, half or more times as long as the tube. — Nodes of the branchlets and inflorescence axes with a pair of wart-like patches . . 40
- b. Calyx lobes up to 1 mm long, usually less than half as long as the tube . . . 43
- 40a. Leaf blades underneath \pm glabrous or sparsely lepidote 41
- b. Leaf blades underneath densely brownish to golden or bronze appressed lepidote **51. A. meyeri**
- 41a. Leaf blades smooth (i.s.), triplinerved at or above the base 42
- b. Leaf blades scabrid (i.s.), 5-nerved at base **56. A. scabrida**
- 42a. Midrib with a pair of nerves at base. Calyx campanulate, c. 3 mm long. Pistillode minute **50b. A. megalantha var. campanulata**
- b. Midrib with a pair of nerves from 0–10 mm above the base. Calyx urceolate, 1.5–2 mm long. Pistillode absent . . **50a. A. megalantha var. megalantha**
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- 44a. Nodes of branchlets and inflorescences with circular, wart-like patches . . 45
- b. Nodes of branchlets and inflorescences without circular, wart-like patches. 46
- 45a. Branchlets acutely and persistently quadrangular, 5–8 mm diam. Leaf blades (11–)17–29.5 by (6–)7–19 cm **41. A. candolleana**
- b. Branchlets quadrangular, becoming terete, up to 5 mm diam. Leaf blades 10–21 by 4–8 cm **44. A. ferruginea**
- 46a. Branchlets terete. Petioles 10–22 mm long **47. A. glauca**
- b. Branchlets acutely quadrangular. Petioles 6–8 mm long
- 53. A. quadrangulata**
- 47a. Pedicels and calyces minutely, appressed, greyish-tan farinose-lepidote . . 48
- b. Pedicels and calyces brownish furfuraceous lepidote 50
- 48a. Indument not mixed with scales or bristles, usually dense, minutely lepidote. Branchlets 3–4 mm diam. Leaf blades greenish to brownish (i.s.), underneath glabrous or with minute, appressed, wax-like scales that can be scraped off like wax 49
- b. Indument often mixed with spreading thin scales or bristles, sometimes \pm completely absent. Branchlets c. 5 mm diam. Leaf blades dark brown to blackish (i.s.), underneath never with minute appressed scales that can be scraped off like wax **54. A. rolfei**
- 49a. Branchlets usually wrinkled to rough, dark (i.s.). Leaf blades underneath glabrous to densely, minutely, grey to brown lepidote, also on the major nerves. Inflorescence axes densely lepidote **42a. A. cumingiana var. cumingiana**
- b. Branchlets smooth, straw-coloured (i.s.). Leaf blades underneath densely, minutely, greyish lepidote, major nerves usually glabrous. Inflorescence axes \pm glabrous **42b. A. cumingiana var. bicolor**
- 50a. Leaf blades underneath glabrous to scattered lepidote with 1 or 2 scales per reticulation, distinctly reticulately veined 51
- b. Leaf blades underneath densely furfuraceous to waxy lepidote, each reticulation with 4 or more scales, often concealed by the indument 54

- 51a. Leaf blades usually subcoriaceous. Calyx tube 1.25–1.5 mm long, lobes 0.5–1 mm long 52
- b. Leaf blades usually thin. Calyx tube up to 1 mm long, lobes 0.25–0.3 mm long 53
- 52a. Young leaf blades underneath sparsely furfuraceous, older ones usually glabrous. Calyx tube cupular, c. 1.25 mm long, lobes c. 0.5 mm long
46. *A. gitingensis*
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- 53a. Midrib of leaf blades with a pair of nerves from 1.5–5 mm above the base. Calyx with V-shaped sinuses between the lobes
37a. *A. acuminatissima* var. *acuminatissima*
- b. Midrib of leaf blades with a pair of nerves at base or up to 2 mm above it. Calyx with U-shaped sinuses between the lobes
37b. *A. acuminatissima* var. *palawanensis*
- 54a. Nodes of the branchlets and inflorescence axes with pale wart-like patches 55
- b. Nodes of the branchlets and inflorescence axes without wart-like patches
52. *A. pulchra*
- 55a. Midrib of leaf blades with a pair of nerves at base or from up to 3 mm above it, upper surface with raphids. Inflorescences 8–12 cm long. — Taiwan
45. *A. formosana*
- b. Midrib of leaf blades with a pair of nerves at base or from up to 20 mm above it, upper surface without raphids. Inflorescences 4–7 cm long. — Philippines
59a. *A. williamsii* var. *williamsii*
- 56a. (38). Calyx tube 1.5–2 mm long, lobes up to 0.5 mm long. Pistillode absent. — Malay Peninsula, Borneo 57
- b. Calyx tube c. 3 mm long, lobes c. 0.75 mm long. Pistillode present. — Java, Lombok 31. *A. spectabilis*
- 57a. Leaf blades underneath densely appressed, brown, usually persistently lepidote. Calyx tube c. 1.5 mm long, lobes c. 0.5 mm long. — Sabah
55. *A. sabahensis*
- b. Leaf blades underneath glabrous to sparsely lepidote. Calyx tube c. 2 mm long, lobes up to 0.3 mm long. — Malay Peninsula, Sarawak, Kalimantan
57. *A. smilacifolia*
- 58a. (11). Calyx tube campanulate, urceolate, or funnelform, not or only slightly wider than long 59
- b. Calyx tube depressed pyriform, c. 3 mm long by 6 mm diam. 27. *A. rugosa*
- 59a. Calyx lobes much thicker than the tube, rugose 60
- b. Calyx lobes not thicker than the tube, not rugose 63
- 60a. Calyx lobes erect, broadly rounded, 0.5–1 mm long, apex obtuse to cuspidate. — Ovary 2–4-locular 61
- b. Calyx lobes spreading, c. 1.5 mm long, broadly triangular, apex acute. — Ovary 4- or 5-locular 30. *A. sorongensis*
- 61a. Calyx tube 1.5–2.5 mm long, lobes 0.5–0.75 mm long 62
- b. Calyx tube 3–4 mm long, lobes up to 1 mm long 2. *A. arborea*

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- 76a. Leaf blades usually with a pair of nerves from above the base of the midrib. Calyx tube 2.5–3.75 mm long, lobes 0.5–1.25 mm long 77
 b. Leaf blades with a pair of nerves at the base of the midrib. Calyx tube 3–4 mm long, lobes c. 1.5 mm long 3. *A. atroviridis*
- 77a. Leaf blades elliptic to oblong, rarely lanceolate, apex obtuse to cuspidate. — Blades with or without raphids 78
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- 80a. Calyx tube with longitudinal ridges and grooves (i.s.) 81
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- 81a. Leaf blades underneath pale brown pubescent, apex abruptly cuspidate. Pedicels up to 2 mm long. Calyx tube c. 2.75 mm long. — New Britain, New Ireland 13. *A. cuspidata*
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- 82a. Leaf blades with flat margins, apex obtuse to sharply acute. Calyx tube 3–3.5 mm long 21. *A. ledermannii*
 b. Leaf blades with revolute margins, apex sharply acuminate. Calyx tube c. 2.5 mm long 6. *A. brunnea*
- 83a. (75). Branchlets acutely quadrangular 84
 b. Branchlets obscurely quadrangular to terete 85
- 84a. Nodes of the branchlets and axes of the inflorescences or infructescences with wart-like patches. Petioles 3–8.5 cm long. Leaf blades (11–)17–20.5 by (6–)7–19 cm 41. *A. candolleana*
 b. Nodes of the branchlets and axes of the inflorescences or infructescences without wart-like patches. Petioles 0.6–0.8 cm long. Leaf blades 5–12.5 by 1.75–3 cm 53. *A. quadrangulata*
- 85a. Nodes of the branchlets and axes of the inflorescences or infructescences with 4 wart-like patches. Leaf blades with a pair of nerves from 1–8 mm above the base. — Philippines 44. *A. ferruginea*
 b. Nodes of the branchlets and axes of the inflorescences or infructescences without wart-like patches. Leaf blades with a pair of nerves at base. — Moluccas
 23. *A. papetaria*
- 86a. (63). Calyx lobes finally broadly rounded to truncate, not acute, sometimes cuspidate 87
 b. Calyx lobes finally triangular, apex acute. 92
- 87a. Calyx tube without longitudinal ridges and grooves (i.s.) 88
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- 88a. Calyx tube 1.5–3 mm long. Capsules subglobose to urceolate, constricted area not elongated into a distinct neck. — Ovaries and capsules 2- or 3-locular 89
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- 89a. Lower surface of the leaf blades and axes of the inflorescences or infructescences glabrous to sparsely furfuraceous. — Ovaries and capsules 2- or 3-locular 90
- b. Lower surface of the leaf blades and axes of the inflorescences or infructescences usually densely furfuraceous lepidote. — Ovaries and capsules 3-locular **15. A. glomerata**
- 90a. Inflorescences or infructescences paniculate. Calyx tube c. 1.5 mm long, lobes broadly triangular, apex acute. Anthers circular in outline. — Celebes, Moluccas 104
- b. Inflorescences or infructescences corymbose. Calyx tube c. 3 mm long, lobes broadly rounded, apex cuspidate. Anthers oblong. — New Guinea
- 11. A. corymbosa**
- 91a. Calyx tube urceolate cyathiform, c. 3 mm long. Capsules with a prominently elongated, c. 2 mm long neck **9. A. columnaris**
- b. Calyx tube urceolate, 3–4 mm long. Capsules urceolate, neck not elongated
- 20. A. laevis**
- 92a. (86). Pedicels and calyx tubes minutely appressed, greyish tan, farinose lepidote 93
- b. Pedicels and calyx tubes brownish, rarely greyish lepidote 95
- 93a. Branchlets, petioles, main nerves on the lower surface of the leaf blades, main axes of the inflorescences or infructescences without scales or bristles, usually densely minutely furfuraceous. Branchlets 3–4 mm diam. Leaf blades greenish to brownish (i.s.). Calyx tube up to 1.5 mm long 94
- b. Branchlets, petioles, main nerves on the lower surface of the leaf blades, main axes of the inflorescences or infructescences often with spreading scales or bristles, rarely nearly glabrous. Branchlets c. 5 mm diam. Leaf blades dark brownish black (i.s.). Calyx tube c. 2 mm long **54. A. rolfei**
- 94a. Branchlets usually terete, brownish to greyish and finally wrinkled to scaberrulous (i.s.). Leaf blades underneath and most of the main veins glabrous to densely, minutely, greyish lepidote. Apex of fruit convex, protruding beyond the margin of the areole **42a. A. cumingiana var. cumingiana**
- b. Branchlets usually quadrangular, straw-coloured and finally smooth (i.s.). Leaf blades underneath densely, minutely, greyish lepidote, main nerves usually glabrous, dark. Apex of fruit concave, not protruding beyond the margin of the areole **42b. A. cumingiana var. bicolor**
- 95a. Plants from continental Asia and Malesia 96
- b. Plants from Taiwan **45. A. formosana**
- 96a. Nodes of the branchlets and axes of the inflorescences or infructescences with pale, circular, wart-like patches. — Philippines 97
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- 97a. Secondary nerves of the leaf blades 8–12 mm apart, lower surface pale brown pubescent. Calyx tube urceolate, c. 2.5 mm long. . 48. *A. katangladensis*
 b. Secondary nerves of the leaf blades c. 5 mm apart, lower surface usually grey pubescent. Calyx tube campanulate urceolate, c. 2 mm long
 59a. *A. williamsii* var. *williamsii*
- 98a. Calyx tube 2–3 mm long by c. 3 mm diam 99
 b. Calyx tube 1–1.5 mm long by 1–1.5 mm diam. (unknown in *A. benguetensis*, probably small) 104
- 99a. Branchlets and petioles sparsely to densely brown furfuraceous lepidote. Leaf blades underneath glabrous or brown furfuraceous lepidote, but not glaucous nor wax-like. — Not from the Philippines 100
 b. Branchlets and petioles sparsely minutely greyish lepidote. Leaf blades underneath densely glaucous and wax-like. — Stamens subequal. Philippines
 47. *A. glauca*
- 100a. Plants from continental Asia, Sumatra, Java, Borneo, or the Moluccas . . 101
 b. Plants from New Guinea 5. *A. brunnea*
- 101a. Filaments inserted anteriorly on the anthers, near the locules. — Leaf blades 6–18 by 2–7.5 cm, with a pair of nerves at the base of the midrib, or from up to 3 mm above it 102
 b. Filaments inserted posteriorly on the anthers. — Leaf blades 9–35 by 5–13 cm, with 1 or 2 pairs of nerves from 5–12 mm above the base
 22. *A. macrophylla*
- 102a. Plants from the Malay Peninsula and Borneo 103
 b. Plants from the Philippines 58. *A. viridifolia*
- 103a. Leaf blades underneath densely, appressed, usually persistently lepidote. Calyx tube campanulate urceolate, lobes c. 0.5 mm long. — Sabah
 55. *A. sabahensis*
 b. Leaf blades underneath glabrous to sparsely lepidote. Calyx tube cupular campanulate, lobes c. 0.3 mm long. — Malay Peninsula, Sarawak, Kalimantan
 57. *A. smilacifolia*
- 104a. Stigma 0.75–1.25 mm diam. — Celebes, Moluccas 105
 b. Stigma up to 0.5 mm diam. — Philippines 106
- 105a. Leaves in whorls of three, c. 4 cm wide 16. *A. gracilis*
 b. Leaves opposite, 5–5.5 cm wide 33. *A. stapfii*
- 106a. Leaf blades usually with a pair of nerves at base. Calyx tube 1.5–2.5 mm long (unknown in *A. benguetensis*), lobes 0.5–1 mm long. Capsules 4–6 mm long by 3–6 mm diam. 107
 b. Leaf blades usually with a pair of nerves 1.5–2 mm above the base. Calyx tube 1–1.5 mm long, lobes up to 0.5 mm long. Capsules 2–3.5 mm long by 2–3.5 mm diam. 108
- 107a. Leaf blades suborbicular to oblong, apex bluntly acute to obtuse, basal nerves 1 or 2 pairs. Capsules c. 3 mm long by 4 mm diam. 40. *A. benguetensis*
 b. Leaf blades oblong to lanceolate, apex sharply acuminate to cuspidate, basal nerves 1 pair. Capsules 5–6 mm long by 5.5–6 mm diam.
 58. *A. viridifolia*

Distribution. New Guinea, Irian Jaya: Vogelkop, Jayapura Prov.; Papua New Guinea: E Sepik, Enga, Eastern and Western Highlands, Chimbu, Morobe, Central, Milne Bay Prov.

Habitat. Primary (*Nothofagus* and mixed) or secondary forests, often mossy; 1630–3170 m.

4. *Astronia beccariana* Cogn.

Astronia beccariana Cogn. in DC., Monogr. Phan. 7 (1891) 1098. — *Pharmacum beccarianum* O. Ktze, Rev. Gen. Pl. 3 (1898) 953. — **T y p e:** *Beccari PP 724* (G, holo; FI), Irian Jaya, Vogelkop Prov., Andai.

Distribution. New Guinea, Irian Jaya: Vogelkop Prov.; Papua New Guinea: E Sepik, Morobe Prov.

Habitat. Rain forests; 0–600 m.

5. *Astronia brunnea* Maxw., *spec. nov.*

Arbor raro frutex 4–12 m altus, caule 2–5 m longo 4–10 cm diam. Ramuli obscure quadrangulares ad tereti 2–2.5 mm diam. dense minute brunnee lepidoti plerumque lenticellis elongatis. Petioli 10–16 mm longi pubescentia ut in ramuli. Laminae subcoriaceae oblongae ad lanceolatae 7–13 cm longae 1.5–4 cm latae, basi acuto, marginibus distaliter planis, apice acuminato ad rostrato, costa uno pare nervorum 2–5 mm supra basin orienti, pare inframarginali tenuissimo, supra glabra raphidibus conspicuis, infra dense persistentiter appresse brunnee lepidotae nervis secundariis obscuratis. Inflorescentiae paniculatae 4–7 cm longae, axibus quadrangularibus ad applanatis pubescentia ut in ramulis. Pedicelli dense minute brunnee lepidoti. Flores 5-meri staminati bisexualesque. Calyx dense minute brunnee lepidotus, lobis late rotundata cuspidatis. Petala orbicularia 3.5–5 mm diam. rosea ad alba. Stamina aequalia ad subaequalia, antheribus oblongis posterioriter elongatis c. 2 mm longis. Stylus 2–3 mm longus, stigmate capitato c. 1 mm diam. Flores staminati: Calycis tubus campanulatus c. 3 mm longus, lobis late rotundatis c. 1 mm longis cuspidatis. Flores bisexuales: Calycis tubus urceolatus c. 2.75 mm longus, lobis late triangularibus c. 0.5 mm longis, acutis interdum cuspidatis. Ovarium 3-loculare. Capsulae urceolatae c. 5 mm longae 4.5 mm diam. dense lepidotae. Semina linearia c. 2 mm longa. — **T y p u s:** *Vink 16814* (L, holo; A, LAE, MO), Papua New Guinea, Southern Highlands Prov., Tari Subdist., Tigibi, depleted *Castanopsis* forest, 1570 m alt., 8 June 1966.

Tree, rarely a shrub, 4–12 m high, bole 2–5 m long, 4–10 cm diam. Branchlets obscurely quadrangular to terete, 2–2.5 mm diam., densely, minutely, brown lepidote, often with elongated lenticels. Petioles 10–16 mm long, pubescent as the branchlets. *Blades* subcoriaceous, oblong to lanceolate, 7–13 by 1.5–4 cm, base acute, margins distally flat, apex acuminate to rostrate, midrib with one pair of nerves from 2–5 mm above the base, inframarginal pair very thin, upper surface glabrous with conspicuous raphids, lower surface densely, persistently, appressed brown lepidote, the secondary nerves obscured. *Inflorescences* paniculate, 4–7 cm long, axes quadrangular to flattened, pubescent as the branchlets. Pedicels densely minutely brown lepidote. *Flowers* 5-merous, staminate and bisexual. Calyx densely minutely brown lepidote, lobes broadly rounded, cuspidate. Petals orbicular, 3.5–5 mm diam., pinkish to white. *Stamens* equal to subequal, anthers oblong, posteriorly elongated, c. 2 mm long. Style 2–3 mm long, stigma capitate, c. 1 mm diam. *Sta-*

minate flowers: Calyx tube campanulate, c. 3 mm long, lobes broadly rounded, c. 1 mm long, cuspidate. *Bisexual flowers*: Calyx tube urceolate, c. 2.75 mm long, lobes broadly triangular, c. 0.5 mm long, acute, sometimes cuspidate. Ovary 3-locular. Capsules urceolate, c. 5 mm long by 4.5 mm diam., densely lepidote. Seeds linear, c. 2 mm long.

Distribution. New Guinea, Irian Jaya: Snow Mountain Prov.; Papua New Guinea: W Sepik, Enga, Southern Highlands Prov.

Habitat. Primary and secondary forests; 1200–2100 m.

6. *Astronia brunneo-aenea* Maxw., *spec. nov.*

Astronia holrrungii Cogn. affinis. Arbor 3–8 m alta. Ramuli acute quadrangulares 3–4 mm diam. dense furfuraceo-lepidoti. Petioli 1.5–3 cm longi furfuraceo-lepidoti. Laminae subcoriaceae oblongae 15–19 cm longae 5–6 cm latae, basi acuto, marginibus distaliter revolutis, apice breviter acuminato, costa uno pare nervorum c. 2 mm supra basin orienti, pare inframarginali obscuro, supra glabrae, infra dense appresse minute persistentiter brunneo-aenae lepidotae. Inflorescentiae paniculatae 6–11 cm longae, axibus ramulis similibus. Flores 5-meri staminati bisexualesque. Calyx dense furfuraceo-lepidotus, lobis late rotundatis. Flores staminati: Calycis tubus campanulatus c. 1.75 mm longus, lobis 0.5–0.75 mm longis. Petala suborbicularia 3–3.5 mm longa 2.25–3.5 mm lata, basi late unguiculato, apice late rotundato. Stamina aequalia ad subaequalia, filamentis aequalia 1.5–2 mm longis, antheribus oblongis, c. 1.5 mm longis, alternipetalibus vulgo apice posteriore angustiore. Stylus stigmaque bene evolutum. Flores bisexuales: Calycis tubus urceolatus c. 2.5 mm longus laevis, lobis c. 0.5 mm longis. Stylus 2–2.5 mm longus, stigmate globoso c. 1 mm diam. Ovarium 3-loculare. Capsulae subgloboso-urceolatae c. 5 mm longae c. 5 mm diam. Semina linearia c. 3.5 mm longa. — **T y p u s**: Carr 12048 (SING, holo; A, L), Papua New Guinea, Central Prov., Owen Stanley Range, Koitaki, 500 m alt., 25 April 1935.

Tree, 3–8 m high. Branchlets sharply quadrangular, 3–4 mm diam., densely furfuraceous lepidote. Petioles 1.5–3 cm long, furfuraceous lepidote. *Blades* subcoriaceous, oblong, 15–19 by 5–6 cm, base acute, margins distally revolute, apex shortly acuminate, midrib with one pair of nerves from c. 2 mm above the base, inframarginal pair obscure, upper surface glabrous, lower surface densely, minutely, persistent, appressed brown bronze lepidote. *Inflorescences* paniculate, 6–11 cm long, axes as the branchlets. *Flowers* 5-merous, staminate and bisexual. Calyx densely furfuraceous lepidote, lobes broadly rounded, cuspidate. Petals suborbicular, 3–3.5 by 2.25–3.5 mm, base broadly clawed, apex broadly rounded. *Staminate flowers*: Calyx tube campanulate, c. 1.75 mm long, lobes 0.5–0.75 mm long. *Stamens* subequal to equal, filaments equal, 1.5–2 mm long, anthers oblong, c. 1.5 mm long, the alternipetalous ones usually with a slightly narrower posterior end. Style 2–2.5 mm long, stigma globose, c. 1 mm diam. *Bisexual flowers*: Calyx tube urceolate, c. 2.5 mm long, smooth, lobes c. 0.5 mm long. *Ovary* 3-locular. Capsules subglobose urceolate, c. 5 mm long by 5 mm diam. Seeds linear, c. 3.5 mm long.

Distribution. New Guinea: Central Prov.

Habitat. Primary rain forests, 500–600 m.

7. *Astronia bullata* Maxw., *spec. nov.*

Frutex c. 2 m altus. Ramuli tereti c. 2 mm diam. dense brunnee furfuraceo-lepidoti glabrescentes. Petioli 20–32 mm longi pubescentia ut in ramulis. Laminae subcoriaceae oblongae 11–19 cm

longae 4–6 cm latae, basi rotundato, marginibus distaliter revolutis, apice breviter (c. 5 mm longo) acuminato, costa basin uno pare nervorum 2–3 mm supra basin orienti, pare inframarginali tenuiore, supra glabra bullata (i.s.), infra nervis furfuraceis cetera glabris reticulatis. Inflorescentiae paniculatae c. 12.5 cm longae, axibus obtuse quadrangulatis ad teretis dense furfuraceo-lepidotis. Flores 5-meri bisexuales tantum. Calyx dense brunnee furfuraceo-lepidotus, tubo urceolato c. 3 mm longus porcatus, lobis obtuse triangularibus c. 1 mm longis. Petala suborbicularia c. 4 mm longa c. 3.5 mm lata atro-rosea, basi unguiculato, apice obtuse acuto. Stamina aequalia, filamentis c. 1.5 mm longis, antheribus oblongis c. 1.25 mm longis. Stylus c. 2.5 mm longus, stigmatibus globosis c. 1 mm diam. sulcato. Ovarium 2- vel 3-loculare. Capsulae seminaeque n.v. — T y p u s: *Van Royen & Sleumer* 7589 (A, holo; L), Irian Jaya, Vogelkop Prov., Ije River valley, Sujak, 450 m alt., 31 October 1961.

Shrub, c. 2 m high. Branchlets terete, c. 2 mm diam., densely brown furfuraceous lepidote, glabrescent. Petioles 20–32 mm long pubescent as the branchlets. *Blades* subcoriaceous, oblong, 11–19 by 4–6 cm, base rounded, margins distally revolute, apex shortly (c. 5 mm long) acuminate, midrib at base with one pair of nerves from 2–3 mm above the base, inframarginal pair thinner, upper surface glabrous, bullate (i.s.), lower surface with furfuraceous nerves, otherwise glabrous, reticulate. *Inflorescences* paniculate, c. 12.5 cm long, axes bluntly quadrangular to terete, densely furfuraceous lepidote. *Flowers* 5-merous, bisexual ones seen only. Calyx densely brown furfuraceous lepidote, tube urceolate, c. 3 mm long, ridged (i.s.), lobes bluntly triangular, c. 1 mm long. Petals suborbicular, c. 4 by 3.5 mm, dark pink, base clawed, apex obtusely acute. *Stamens* equal, filaments c. 1.5 mm long, anthers oblong, c. 1.25 mm long. Style c. 2.5 mm long, stigma globose, c. 1 mm diam., grooved. *Ovary* 2- or 3-locular. Capsules and seeds not seen.

Distribution. New Guinea, Irian Jaya: Vogelkop Prov.

Habitat. Oak forest; c. 450 m.

8. *Astronia chartacea* Maxw., *spec. nov.*

Habitus ignotus. Ramuli quadrangulares ad tereti c. 2 mm diam. sparse pallide brunnee furfuraceo-lepidoti. Petioli 12–22 mm longi pubescentia ut in ramulis. Laminae chartaceae oblongae ad lanceolatae 12–22 cm longae 4.5–9 cm latae, basi acuto, marginibus distaliter revolutis, apice obtuse acuto, costa basin uno pare nervorum, pare inframarginali tenuissimo, plerumque utrinque glabrae atro-brunneae (i.s.). Inflorescentiae paniculatae 5.5–6.5 cm longae, axibus quadrangularibus ad applanatis furfuraceo-lepidotis. Flores 5-meri, alabastra staminata immatura tantum. Calyx furfuraceo-lepidotus, tubo globoso c. 2 mm longo, lobis triangularibus c. 0.5 mm longis acutis. Stylus stigmaque rudimentale. — T y p u s: *BW 10740* (Schram) (L, holo; LAE, MAN, Z), Irian Jaya, Geelvink Bay Prov., Wandammen Peninsula, Wordiwoi Mts, 350 m alt., 28 February 1962.

Habit unknown. Branchlets quadrangular to terete, c. 2 mm diam., sparsely light brown furfuraceous lepidote. Petioles 12–22 mm long, pubescent as the branchlets. *Blades* chartaceous, oblong to lanceolate, 12–22 by 4.5–9 cm, base acute, margins distally revolute, apex bluntly acute, midrib with one pair of nerves at base, inframarginal pair very thin, usually glabrous and brownish blackish (i.s.) on both sides. *Inflorescences* paniculate, 5.5–6.5 cm long, axes quadrangular to flattened, furfuraceous lepidote. *Flowers* 5-merous, staminate buds seen only. Calyx furfuraceous lepidote, tube globose, c. 2 mm long, lobes triangular, c. 0.5 mm long, acute. Style and stigma rudimentary.

Distribution. New Guinea, Irian Jaya: Geelvink Bay Prov.

Habitat. Primary forest; c. 350 m.

9. *Astronia columnaris* Maxw., *spec. nov.*

Arbor c. 8 m alta c. 8 cm diam. Ramuli obscure quadrangulares ad compressi demum tereti c. 3 mm diam. minute appresse brunnee lepidoti glabrescentes. Petioli 7–15 mm longi sparse lepidoti. Laminae subcoriaceae lanceolatae 8–16 cm longae 2–3,5 cm latae, basi acuto, marginibus planis, apice acuminato, costa uno pare nervorum ad 5 mm supra basin orienti, pare inframarginali inconspicua, supra glabra, infra dense minute appresse cinereo-brunnee lepidotae. Inflorescentiae angustae paniculatae multiflorae 4–5,5 cm longae, axibus obtuse quadrangularibus pubescentia ut in ramulis. Pedicelli c. 2 mm longi. Flores 5-meri bisexuales tantum. Calyx appresse lepidotus, tubo urceolato-cyathiformibus c. 3 mm longo, lobis late rotundatis complanatis c. 0,5 mm longis. Petala suborbicularia c. 4 mm longa c. 3,5 mm lata, basi unguiculato, apice late rotundato. Stamina subaequalia, filamentis 2,75–3 mm longis, antheribus elongatis paulo curvatis, oppositipetalibus c. 2,25 mm longis, alternipetalibus c. 2 mm longis. Stylus c. 5 mm longus, stigmatibus c. 0,3 mm diam. Ovarium 3-loculare. Capsulae urceolatae cyathiformes appresse lepidotae c. 5,5 mm longae c. 5 mm diam., corpore globoso, collo c. 2 mm longo, margine calycem simili. Semina linearia extremis ambobus filiformibus 2–2,25 mm longis. — T y p u s: *NGF 41768* (Henty *et al.*) (SING, holo; A, BISH, BRI, CANB, K, L, LAE, NSW, PNH), Papua New Guinea, W Sepik Prov., Oksapmin, fagaceous forest, 1760 m alt., 28 February 1962.

Tree, c. 8 m high, c. 8 cm diam. Branchlets obscurely quadrangular to compressed, becoming terete, c. 3 mm diam., minutely appressed brown lepidote, glabrescent. Petioles 7–15 mm long, sparsely lepidote. *Blades* subcoriaceous, lanceolate, 8–16 by 2–3.5 cm, base acute, margins flat, apex acuminate, midrib with one pair of nerves from up to 5 mm above the base, inframarginal pair very inconspicuous, upper surface glabrous, lower surface densely minute, appressed, grey brown lepidote. *Inflorescences* narrow, paniculate, many-flowered, 4–5.5 cm long, axes bluntly quadrangular, pubescent as the branchlets. Pedicels c. 2 mm long. *Flowers* 5-merous, only bisexual ones seen. Calyx appressed lepidote, tube urceolate cyathiform, c. 3 mm long, lobes broadly rounded, flattened, c. 0.5 mm long, cuspidate. Petals suborbicular, c. 4 by 3.5 mm, base clawed, apex broadly rounded. *Stamens* subequal, filaments 2.75–3 mm long, anthers elongated, slightly curved, the oppositipetalous ones c. 2.25 mm long, the alternipetalous ones c. 2 mm long. Style c. 5 mm long, stigma c. 0.3 mm diam. *Ovary* 3-locular. Capsules urceolate cyathiform, appressed lepidote, c. 5.5 mm long by 5 mm diam., body globose, neck-like portion c. 2 mm long, margin similar to that of the calyx. Seeds linear, filiform at both ends, 2–2.25 mm long.

Distribution. Papua New Guinea, W Sepik Prov.

Habitat. Fagaceous forest; c. 1750 m.

10. *Astronia coriacea* Maxw., *spec. nov.*

Arbor 15–25 m alta, caule 20–40 cm diam., raro frutex ad 3 m altus. Ramuli acute quadrangulares 5–6 mm diam. plerumque glabri. Petioli plerumque alati 2–6 cm longi ad 4 mm diam. Laminae coriaceae plerumque ellipticae ad oblongae interdum lanceolatae 10–27,5 cm longae 3–12 cm latae, basi acuto, marginibus distaliter revolutis, apice acuto, costa basi uno pare nervorum, pare inframarginali tenui, utrinque plerumque glabrae. Inflorescentiae paniculatae ad corymbosae 6–11 cm longae, axibus acute quadrangularibus ad -alatis vel applanatis bisulcatis sparse furfuraceo-lepidotis. Flores 5-meri. Calyx furfuraceo-lepidotus. Petala suborbicularia c. 1 mm longa c. 1,25 mm lata. Antherae oblongae, c. 1 mm longae. Flores staminati: Calycis tubus campanulatus (in alabas-

tro) c. 1,5 mm longus, lobis late rotundatis c. 0,5 mm longus cuspidatis. Stamina subaequalia. Stylus c. 1 mm longus, stigmatibus rudimentalis. Flores bisexuales: Calycis tubus urceolatus c. 1,5 mm longus, lobis acutis ad late rotundatis c. 0,5–0,75 mm longis saepe cuspidatis. Stylus c. 2 mm longus, stigmatibus capitatus c. 1 mm diam. Ovarium 2- vel 3-loculare. Capsulae subglobosae leviter urceolatae, corpore c. 3 mm longo c. 3 mm diam., lobis c. 1 mm longis. Semina linearia c. 2 mm longa. — **T y p u s**: *Van Royen 3634* (L, holo; A, SING), Irian Jaya, Jayapura Prov., Cycloop Mts, path to G. Baboko, 1400 m alt., 9 November 1954.

Tree, 12–25 m high, bole 20–40 cm diam., infrequently a shrub up to 3 m high. Branchlets sharply quadrangular, 5–6 mm diam., usually glabrous. Petioles usually winged, 2–6 cm long by up to 4 mm diam. *Blades* coriaceous, usually elliptic to oblong, sometimes lanceolate, 10–27.5 by 3–12 cm, base acute, margins distally revolute, apex acute, midrib with one pair of nerves at the base, inframarginal pair thin, usually glabrous. *Inflorescences* paniculate to corymbose, 6–11 cm long, axes sharply quadrangular to 4-winged, or compressed and 2-grooved, sparsely furfuraceous lepidote. *Flowers* 5-merous. Calyx furfuraceous lepidote. Petals suborbicular, c. 1 by 1.25 mm. Anthers oblong, c. 1 mm long. *Staminate flowers*: Calyx tube (in bud) campanulate, c. 1.5 mm long, lobes broadly rounded, c. 0.5 mm long, cuspidate. *Stamens* subequal. Style c. 1 mm long, stigma rudimentary. *Bisexual flowers*: Calyx tube urceolate, c. 1.5 mm long, lobes acute to broadly rounded, c. 0.5–0.75 mm long, often cuspidate. Style c. 2 mm long, stigma capitate, c. 1 mm diam. *Ovary* 2- or 3-locular. Capsules subglobose, slightly urceolate, body c. 3 mm long by 3 mm diam., lobes c. 1 mm long. Seeds linear, c. 2 mm long.

D i s t r i b u t i o n. New Guinea, Irian Jaya: Jayapura, Snow Mountain Prov.; Papua New Guinea: W Sepik, Western, Southern Highlands Prov.

H a b i t a t. Primary rain forest (e.g. *Quercus* and *Castanopsis*), sandy or volcanic soil; 800–2100 m.

11. *Astronia corymbosa* Maxw., *spec. nov.*

Arbor c. 8 m alta, caule c. 15 cm diam., vel frutex ad 4 m altus. Ramuli obtuse quadrangulares ad complanati bisulcati 3–4 mm diam., dense minute appresse brunnescentiter lepidoti glabrescentes, costis lenticellis elongatis pallide brunneis. Petioli 1–3 cm longi. Laminae tenues, oblongae 9,5–23 cm longae 3,5–8 cm latae, basi cuneato, apice breviter acuminato marginibus involutis, costa uno pare nervorum ad 5 mm supra basin orienti, pare inframarginali tenuissimo, supra glabrae, infra sparse furfuraceae lepidotae glabrescentes. Flores 5-meri, bisexuales tantum. Calyx dense minute lepidotus, tubo campanulato ad urceolato, c. 3 mm longo, lobis late rotundatis c. 0,5 mm longis cuspidatis. Petala orbicularia c. 4 mm diam. alba, basi late unguiculato, apice late rotundato. Stamina aequalia, filamentis c. 2 mm longis, antheribus oblongis c. 1,5 mm longis. Stylus c. 3 mm longus, stigmatibus globoso c. 1,25 mm diam. Ovarium 2- vel 3-loculare. Capsulae urceolatae c. 4 mm longae c. 4 mm diam. appresse lepidotae virides. Semina linearia c. 3 mm longa. — **T y p u s**: *BW 10820 (Koster)* (L, holo; LAE, MAN), Irian Jaya, Vogelkop Prov., S of Manokwari, G. Krabo, 200 m alt., 8 November 1960.

Tree, c. 8 m high, bole c. 15 cm diam., or a shrub up to 4 m high. Branchlets quadrangular to flattened and bisulcate, 3–4 mm diam., densely, minutely, appressed brownish lepidote, glabrescent, angles with elongate, pale brown lenticels. Petioles 1–3 cm long. *Blades* thin, oblong, 9.5–23 by 3.5–8 cm, base cuneate, apex

shortly acuminate, with involute margins, midrib with one pair of nerves up to 5 mm above the base, inframarginal pair thin, upper surface glabrous, lower surface sparsely furfuraceous lepidote, glabrescent. *Inflorescences* corymbose, up to 10 cm long, many-flowered. *Flowers* 5-merous, bisexual ones seen only. Calyx densely minute lepidote, tube campanulate to urceolate, c. 3 mm long, lobes broadly rounded, c. 0.5 mm long, cuspidate. Petals orbicular, c. 4 mm diam., white, base broadly clawed, apex broadly rounded. *Stamens* equal, filaments c. 2 mm long, anthers oblong, c. 1.5 mm long. Style c. 3 mm long, stigma globose, c. 1.25 mm diam. *Ovary* 2- or 3-locular. Capsules urceolate, c. 4 mm diam., appressed lepidote, green. Seeds linear, c. 3 mm long.

Distribution. New Guinea, Irian Jaya: Vogelkop Prov.; Papua New Guinea: Western Highlands, Morobe Prov.

Habitat. Rain forests; 200–1270 m.

12. *Astronia crassiloba* Maxw., *spec. nov.*

Arbor 6–13 m alta. Ramuli quadrangulares 2–2.5 mm diam. dense appresse brunnee lepidoti. Petioli 1–3 cm longi. Laminae subcoriaceae, oblongae 7.5–17 cm longae 2.5–6.5 cm latae, basi cuneato, marginibus integris, apice obtuse acuto, costa uno pare nervorum 2–12 mm supra basin orienti, pare inframarginali ad 2 mm supra basin orienti, supra glabrae, infra dense appresse pallide brunnee lepidotae. Inflorescentiae paniculatae. Flores 5-, raro 6-meri. Calyx dense appresse brunnee lepidotus, tubo campanulato, lobis late rotundatis 0.5–0.75 mm longis multo crassioribus rugosis. Flores staminati: calycis tubus c. 3 mm longus, lobis c. 0.5 mm longis. Stamina subaequalia, filamentis ± antheribus aequalibus, antheribus oblongis, oppositipetalibus c. 1.5 mm longis, alternipetalibus paulo minoribus. Stylus 1.5–2 mm longus, stigmatibus globosis c. 0.75 mm diam. Flores bisexuales: calycis tubus c. 1.5 mm longus, lobis c. 0.75 mm longis. Stamina eis florum staminatorum similia. Stylus c. 1.5 mm longus, stigma globoso c. 1 mm diam. Ovarium 2-loculare. Capsulae seminaeque non vidi. — **T y p u s:** *Darbyshire & Hoogland 8348* (SING, holo; CANB, E, L), Papua New Guinea, W Sepik Prov., Aitape Subdist., Wantipi on the Bliri R., 220 m alt., 1 August 1961.

Tree, 6–13 m tall. Branchlets quadrangular, 2–2.5 mm diam., densely appressed brown lepidote. Petioles 1–3 cm long. *Blades* subcoriaceous, oblong, 7.5–17 by 2.5–6.5 cm, base cuneate, margins entire, apex bluntly acute, midrib with one pair of nerves 2–12 mm above the base, inframarginal pair up to 2 mm above the base, upper surface glabrous, lower surface densely appressed pale brown lepidote. *Inflorescences* paniculate. *Flowers* 5-, exceptionally 6-merous. Calyx densely appressed brown lepidote, tube campanulate, lobes broadly rounded, much thicker than the lobes, rugose. *Staminate flowers:* Calyx tube c. 3 mm long, lobes c. 0.5 mm long. *Stamens* subequal, filaments about as long as the anthers, anthers oblong, the oppositipetalous ones c. 1.5 mm long, the alternipetalous ones slightly smaller. Style 1.5–2 mm long, stigma globose, c. 0.75 mm diam. *Bisexual flowers:* Calyx tube c. 1.5 mm long, lobes c. 0.75 mm long. *Stamens* similar to those of the staminate flowers. Style c. 1.5 mm long, stigma globose, c. 1 mm diam. *Ovary* 2-locular. Capsules and seeds not seen.

Distribution. Papua New Guinea: E Sepik, Morobe Prov.

Habitat. Rain forest on slopes and foothills, river banks; 100–1100 m.

13. *Astronia cuspidata* Maxw., *spec. nov.*

Arbor 8–22 m alta, caule ad 14 m longo 15–30 cm diam. anteribus striatoque. Ramuli quadrangulares 3–4 mm diam. dense minute brunnee lepidoti costis lenticellis elongatis tanneis. Petioli 1,5–3 cm longi. Laminae subcoriaceae oblongae ad lanceolatae 8–21,5 cm longae 2,5–7,5 cm latae, basi cuneato, marginibus distaliter revolutis, apice abrupte cuspidato, acumine ad 5 mm longo, costa uno pare nervorum 1–6 mm supra basin orienti, pare inframarginali tenui, supra glabrae, infra dense persistentiter pallide brunnee furfuraceae lepidotae. Inflorescentiae terminales paniculatae laxae 6,5–10 cm longae, axibus ramulis similibus. Pedicelli 1–1,5 mm longi. Flores 5-meri. Staminiibus aequalibus, filamentis c. 2 mm longis, antheribus oblongis c. 1,5 mm longis. Flores staminati: Calyx dense brunnee furfuraceae lepidotus, tubo campanulato c. 1,5 mm longo, lobis late rotundatis c. 0,5 mm longis cuspidatis. Stylus c. 2,5 mm longus, stigmatibus globosis, c. 1 mm diam. Flores bisexuals: Calycis tubus urceolatus, c. 2,75 mm longus longitudinaliter carinatus sulcatusque (i.s.), lobis obtuse triangularibus c. 0,75 mm longis. Stylus c. 2 mm longus, stigmatibus globosis c. 1,25 mm diam. Ovarium 2–4-loculare. Capsulae subglobosae, c. 5 mm longae c. 5,5 mm diam. Semina linearia saepe \pm curvata, c. 3 mm longa. — *T y p u s*: LAE 58323 (Stevens & Lelean) (L, holo; A, BISH, BRI, CANB, E, K, M, NSW, PNH, US), Papua New Guinea, E New Britain Prov., New Britain, Pomio Subdist., Mt Lululua, 120 m alt., 6 May 1973.

Tree, 8–22 m high, bole up to 14 m long, 15–30 cm diam., buttressed and fluted. Branchlets quadrangular, 3–4 mm diam., densely minutely brownish lepidote, ribs with elongate tan-coloured lenticels. Petioles 1.5–3 cm long. *Blades* subcoriaceous, oblong to lanceolate, 8–21.5 by 2.5–7.5 cm, base cuneate, margins distally revolute, apex abruptly cuspidate, acumen up to 5 mm long, midrib with one pair of nerves 1–6 mm above the base, inframarginal pair thin, upper surface glabrous, lower surface densely, persistently, pale brown furfuraceous lepidote. *Inflorescence* terminal, paniculate, spreading, 6.5–10 cm long, axes as the branchlets. Pedicels 1–1.5 mm long. *Flowers* 5-merous. *Stamens* equal, filaments c. 2 mm long, anthers oblong, c. 1.5 mm long. *Staminate flowers*: calyx densely furfuraceous lepidote, tube campanulate, c. 1.5 mm long, lobes broadly rounded, c. 0.5 mm long, cuspidate. Style c. 2.5 mm long, stigma globose, c. 1 mm diam. *Bisexual flowers*: tube urceolate, c. 2.75 mm long, with longitudinal ridges and grooves (i.s.), lobes bluntly triangular, c. 0.75 mm long. Style c. 2 mm long, stigma globose, c. 1.25 mm diam. *Ovary* 2–4-locular. Capsules subglobose, c. 5 mm long by 5.5 mm diam. Seeds linear, often slightly curved, c. 3 mm long.

Distribution. Papua New Guinea, E New Britain, New Ireland Prov.

Habitat. Primary (*Nothofagus* dominated?) and disturbed forests, on limestone; 800–1220 m.

14. *Astronia elaterinervis* Maxw., *spec. nov.*

Arbor ad 10 m alta, caule ad 15 cm diam. Ramuli quadrangulares dense brunnee furfuraceo-lepidoti. Petioli 1,5–5 cm longi dense furfuracei glabrescentes. Laminae subcoriaceae ellipticae ad lanceolatae 8–18 cm longae 3–10,5 cm latae, basi acuto, marginibus distaliter revolutis, apice obtuso vel cuspe 1–2 mm longa, costa basin sine pare nervorum, pare inframarginali 1–2 mm supra basin orienti, supra glabrae, infra dense appresse pallide brunnee lepidotae. Inflorescentiae paniculatae c. 5,5 cm longae, axibus ramulis similibus. Flores 5-meri staminati tantum (in alabastro). Calyx dense furfuraceo-lepidotus, tubo campanulato c. 2,5 mm longo, lobis triangularibus c. 0,5 mm longis acutis. Stamina aequalia (in alabastro), filamentis c. 1 mm longis prope parte posteriore antherae

affixis, antheris oblongis c. 1 mm longis. Stylus c. 1 mm longus, stigmatе globoso c. 1 mm diam. — T y p u s: *BW 13893 (Koster)* (L, holo; MAN), Irian Jaya, Vogelkop Prov., Arfak Mts, Minyambau, young secondary forest, 1230 m alt., 20 May 1962.

Tree, up to 10 m high, bole 15 cm diam. Branchlets quadrangular, densely brown furfuraceous lepidote. Petioles 1.5–5 cm long, densely furfuraceous, glabrescent. *Blades* subcoriaceous, elliptic to lanceolate, 8–18 by 3–10.5 cm, base acute, margins distally revolute, apex obtuse or with a 1–2 mm long cusp, midrib without a pair of nerves at base, inframarginal nerves thin, 1–2 mm above the base, upper surface glabrous, lower surface densely appressed pale brown lepidote. *Inflorescences* paniculate, c. 5.5 cm long, axes as the branchlets. *Flowers* 5-merous, staminate ones seen only (in bud). Calyx densely furfuraceous lepidote, tube campanulate, c. 2.5 mm long, lobes triangular, c. 0.5 mm long, acute. *Stamens* equal (in bud), filaments c. 1 mm long, attached near the posterior end of the anther, anthers oblong, c. 1 mm long. Style c. 1 mm long, stigma globose, c. 1 mm diam.

Distribution. New Guinea, Irian Jaya: Vogelkop Prov.

15. *Astronia glomerata* Mansf.

Astronia glomerata Mansf., Bot. Jb. 60 (1925) 132. — T y p e: *Ledermann 8605* (B, holo, not extant; SING), Papua New Guinea, E Sepik Prov., Aprilfluss, 100 m, 9 September 1912.

Astronia ternatana Bakh. f., Blumea 5 (1942) 219. — L e c t o t y p e: *Beguín 692* (L, holo; BO) (here appointed), Moluccas, Ternate, Laguna, 450 m, 17 May 1920.

Astronia papetarioides Bakh. f., Thesis (1943) 304. — T y p e: *Beguín 1573* (L, holo; BO, U), Moluccas, Ternate, Foramadiah, 500 m, 27 April 1921.

Distribution. Moluccas: Morotai, Halmaheira, Ternate; New Guinea, Irian Jaya: Geelvink Bay (Japen I.), Jayapura Prov.; Papua New Guinea, W and E Sepik, Milne Bay (Goodenough I.) Prov.

Habitat. Primary rain forest; 60–1700 m.

16. *Astronia gracilis* Bakh. f.

Astronia gracilis Bakh. f., Thesis (1943) 302. — T y p e: *bb CEL/V-291* (L, holo; BO), Celebes, Malili, Toli-toli, 11 May 1934.

Distribution. Celebes: Malili.

Habitat. Not indicated.

Note. Conspicuous for the leaves in whorls of three. Otherwise apparently similar to the badly known *Astronia stapfii*, but leaves smaller.

17. *Astronia grandiflora* Maxw., *spec. nov.*

Vegetative *A. arborea* Baker f. et *A. glomerata* Mansf. similis. Arbor 7–17 m alta, caule ad 7 m longo 20 cm diam. Ramuli quadrangulares 5–6 mm diam. dense ferrugineae floccosi setis erectis ad patentibus barbatis furfuraceis ad 1 mm longis immixti. Petioli 1.2–2 cm longi pubescentia ramulis simili. Laminae oblongae 8–23 cm longae 2.5–7.5 cm latae basi acuto, marginibus distaliter revolutis, apice acuto ad acuminato, costa uno pare nervorum ad 10 mm supra basin orienti, pare inframarginali multo tenuiore, supra glabrae, infra dense persistentiter brunnee lepidotae. Inflorescen-

tiae terminales paniculatae 3.5–8 cm longae axibus ramulis similibus. Bracteae caducae subulatae 1–2 mm longae pubescentia ramulis simili. Pedicelli c. 2 mm longi. Flores 5-meri staminati tantum vidi. Calyx dense brunneo-furfuraceo lepidotus, tubo campanulato incrassato c. 3.25 mm longo, lobis triangularibus 1–1.5 mm longis acutis sinibus late V-formibus. Petala 5 libera suborbicularia c. 3 mm longa c. 3.5 mm lata brunneola ad eburnea ad alba, basi late unguiculato, apice rotundato. Stamina 10 subaequalia ad aequalia, filamentis c. 1.5 mm longis, antheribus c. 2 mm longis, filamentis posterioriter affixis. Ovarium immaturum. Stylus c. 2 mm longus, stigmatibus globosis c. 1 mm diam. Capsulae veteres tantum urceolato-subglobosae 3-loculares c. 8 mm diam. Semina non vidi. — *T y p u s*: *Hoogland & Craven 10831* (L, holo; A, BO, BRI, CANB, G, K, LAE, US), Papua New Guinea, E Sepik Prov., Mt Hunstein, c. 1300 m alt., 8 August 1966.

Tree, 7–17 m high, bole up to 7 m tall by 20 cm diam. Branchlets quadrangular, 5–6 mm diam., densely ferrugineous floccose, mixed with erect to spreading, barbed, up to 1 mm long, furfuraceous bristles. Petioles 1.2–2 cm long, pubescent as the branchlets. *Blades* oblong, 8–23 by 2.5–7.5 cm, base acute to cuneate, margins apically involute, apex acute to acuminate, midrib with one pair of nerves from up to 10 mm above the base, inframarginal pair much thinner, upper surface glabrous, dark and glossy green, lower surface densely persistently brown lepidote. *Inflorescences* terminal, paniculate, 3.5–8 cm long, axes as the branchlets. Bracts caducous, subulate, 1–2 mm long, pubescent as the branchlets. Pedicels c. 2 mm long. *Flowers* 5-merous, staminate ones seen only. Calyx densely brown furfuraceous lepidote, tube campanulate, thickened, c. 3.25 mm long, lobes triangular, 1–1.5 mm long, acute, sinuses broadly V-shaped. Petals 5, free, suborbicular, c. 3 by 3.5 mm, brownish to creamy white to white, base broadly clawed, apex rounded. *Stamens* 10, subequal to equal, filaments c. 1.5 mm long, anthers c. 2 mm long, filaments attached to the posterior end. *Ovary* not developed. Style c. 2 mm long. Stigma globose, c. 1 mm diam. Capsules urceolate-subglobose, 3-locular, c. 8 mm diam., old ones seen only. Seeds not seen.

Distribution. Papua New Guinea, E Sepik, Enga, Western Highlands Prov.

Habitat. Primary rain and secondary forests; 1300–2550 m.

Note. Vegetatively similar to *Astronia arborea* Baker f. and *A. glomerata* Mansf., i.e. branchlets, lower surface of the blades, and inflorescence densely, persistently, ferrugineous furfuraceous lepidote, and blades with a pair of nerves from up to 10 mm above the base. Differs by: Branchlets and inflorescence axes often with barbed hairs. Calyx tube of staminate flowers campanulate, c. 3.25 mm long, thickened, lobes triangular, 1–1.5 mm long, acute. Capsules 3-locular.

18. *Astronia hollrungii* Cogn.

Astronia hollrungii Cogn. in K. Schum. & Holtr., Fl. Kais. Wilh. Land (1889) 88. — *Pharmacum hollrungii* O. Ktze, Rev. Gen. Pl. 3 (1898) 954 ('*holirungii*'). — *T y p e*: *Hollrung 616* (B, holo, not extant; BO), Papua New Guinea, Madang Prov., Constantinhafen (= ± Melamu, 145° 50' E, 5° 28' S), between Wollembik and Babuk, May 1886.

Distribution. New Guinea, Irian Jaya: Vogelkop, Fakfak, Mimika, Digul Prov.; Papua New Guinea: E Sepik, Western and Eastern Highlands, Madang, Morobe, Central, Northern, Milne Bay Prov.

Habitat. Lowland to mountain forests, sometimes disturbed; 0–1600 m.

19. *Astronia klabatensis* Maxw., *spec. nov.*

Arbor ad 20 m alta 50 cm diam. Ramuli obtuse quadrangulares 4–5 mm diam. dense minute furfuraceo-lepidoti. Petioli 18–33 mm longi dorsaliter anguste sulcati sparse furfuraceo-lepidoti. Laminae subcoriaceae ellipticae ad oblongae 7,5–17 cm longae 3–8,25 cm latae, basi acuto, marginibus distaliter revolutis, apice acuto saepe quam cuspis incrassata deformata ut videtur, costa uno pare nervorum 1–4 mm supra basin orienti, supra glabra, infra glabra costis principalibus sparse furfuraceis. Inflorescentiae paniculatae 11–15 cm longae, axibus acute quadrangularibus pubescentia ut in ramulis. Flores 5-meri staminati tantum. Calyx dense minute furfuraceo lepidotus, tubo cupulato c. 1 mm longo, margine initio lobis obtuse triangularibus c. 0,2 mm longis demum truncato minute cuspidato. Petala c. 1,5 mm longa c. 1,5 mm lata. Stamina subaequalia, antheribus oblongis 0,75–1 mm longis, postice appendiculo obtuso. Stylus stigmaque bene evolutum. — T y p u s: *Forman 256* (SING, holotype; A, BM, BO, BZF, IBSC, K, KEP, L, LAE, NSW, NY, P, PNH, SAN, US), NE Celebes, Minahasa, North slope of G. Klabat, forest, 500 m alt., 27 June 1956.

Tree, up to 20 m high, 50 cm diam. Branchlets obtusely quadrangular, 4–5 mm diam., densely minutely furfuraceous lepidote. Petioles 18–33 mm long, dorsally narrowly grooved, sparsely furfuraceous lepidote. *Blades* subcoriaceous, elliptic to oblong, 7.5–17 by 3–8.25 cm, base acute, margins distally revolute, apex acute, often apparently as a thickened deformed cusp, midrib with one pair of nerves 1–4 mm above the base, upper surface glabrous, lower surface glabrous but for the sparsely furfuraceous main nerves. Inflorescences paniculate, 11–15 cm long, axes sharply quadrangular, pubescent as the branchlets. *Flowers* 5-merous, staminate ones seen only. Calyx densely minutely furfuraceous lepidote, tube cupular, c. 1 mm long, margin at first with bluntly triangular, c. 0.2 mm long lobes, later truncate, minutely cuspidate. Petals c. 1.5 by 1.5 mm. *Stamens* subequal, anthers oblong, 0.75–1 mm long, with an obtuse posterior appendage. Style and stigma well developed.

Distribution. Celebes: Minahasa.

Habitat. Forest; c. 500 m.

20. *Astronia laevis* Maxw., *spec. nov.*

Arbor 8–17 m alta. Ramuli acute quadrangulares 2–3 mm diam. glabri lenticellati. Petioli 10–15 mm longo glabri. Laminae subcoriaceae lanceolatae interdum oblongae 9–13,5 cm longae 3–5 cm latae, basi acuto, marginibus distaliter revolutis, apice acuminato, costa uno pare nervorum 1–3 mm supra basin orienti, pare inframarginali tenuissimo, supra glabrae, infra sparse minute lepidotae ad glabrae. Flores 5-meri bisexuales tantum. Calyx sparse furfuraceo-lepidotus, tubo urceolato 3–4 mm longo laevi, lobis late rotundatis 0,2–0,5 mm longis cuspidatis. Stamina subaequalia, antheribus c. 1,5 mm longis. Ovarium 3-loculare. Capsulae subglobosae ad urceolatae sine collo extenso c. 5 mm longae c. 6 mm diam. Semina linearia 2,5–3 mm longa. *Astronia hollrungii* Cogn. affinis. — T y p u s: *Clemens 313* (L, holotype; A, Z), Papua New Guinea, Morobe Prov., Sattelberg, forest, 1000 m alt., 3 October 1935.

Tree, 8–17 m high. Branchlets sharply quadrangular, 2–3 mm diam., glabrous, lenticellate. Petioles 10–15 mm long, glabrous. *Blades* subcoriaceous, lanceolate, sometimes oblong, 9–13.5 by 3–5 cm, base acute, margins distally revolute, apex acuminate, midrib with a pair of nerves 1–3 mm above the base, inframarginal pair very thin, upper surface glabrous, lower surface sparsely minutely lepidote to glabrous. *Flowers* 5-merous, bisexual ones seen only. Calyx sparsely furfuraceous-

lepidote, tube urceolate, 3–4 mm long, smooth, lobes broadly rounded, 0.2–0.5 mm long, cuspidate. *Stamens* subequal, anthers c. 1.5 mm long. *Ovary* 3-locular. Capsules subglobose to urceolate, neck not extended, c. 5 mm long by 6 mm diam. Seeds linear, 2.5–3 mm long.

Distribution. Papua New Guinea, Morobe Prov.

Habitat. Primary rain forests, river banks; c. 1000 m.

21. *Astronia ledermannii* Mansf.

Astronia ledermannii Mansf., Bot. Jb. 60 (1925) 133. — *Type*: *Ledermann 11035* (B, holo, not extant), Papua New Guinea, E Sepik Prov., Hunsteinspitze, 1350 m, 26 February 1913.

Astronia ledermannii Mansf. var. *lepidotior* Mansf., Bot. Jb. 60 (1925) 133. — *Type*: *Ledermann 13098* (B, holo, not extant; L), Papua New Guinea, E Sepik Prov., Felsspitze (= Rocky Peak, 141° 28' E, 4° 10' S), 1400–1500 m, 24 August 1913.

Distribution. New Guinea, Irian Jaya: Vogelkop Prov., Snow Mountains Prov.; Papua New Guinea: W and E Sepik, Western, Southern, Easter Highlands, Madang, Morobe, Central, Milne Bay, W New Britain Prov.

Habitat. Primary rain forests (with e.g. *Nothofagus*, *Lithocarpus*, *Araucaria*) and disturbed areas; 0–2700 m.

22. *Astronia macrophylla* Blume

Astronia macrophylla Blume, Bijdr. 17 (1826) 1080. — *Pharmacum macrophyllum* O. Ktze, Rev. Gen. Pl. 1 (1891) 248. — *Lectotype*: *Blume s.n.* (L, holo, no. 908.129-1603; iso: -1583, -1606) (here appointed), Java, G. Salak.

Astronia macrophylla Blume var. *concolor* Blume, Flora 14 (1831) 527; Bijdr. Nat. Wet. 6 (1831) 268. — *Type*: *Zippel 73* (L no. 925.250-240), Moluccas, Ambon.

[*Astronia macrophylla* Blume var. β Blume, Flora 14 (1831) 526. —] *Astronia macrophylla* Blume var. *discolor* G. Don, Gen. Syst. 2 (1832) 802. — *Lectotype*: *Kuhl & van Hasselt s.n.* (L, holo, no. 908.129-1586; E) (here appointed), Java, 'Kapang dungan'. Don's varietal combination is very likely the naming of *Astronia macrophylla* Blume var. β Blume — JFV.

Distribution. Burma (Tenasserim), Andaman & Nicobar Islands, Malay Peninsula (Johore), Sumatra (Aceh, W Coast, E Coast, Simalur), Java (W), Sarawak, Sabah, Kalimantan (once: *Korthals s.n.*, L), Celebes (Talaud I.), Moluccas (Ambon).

Habitat. Primary forests; 60–500 m.

23. *Astronia papetaria* Blume

Astronia papetaria Blume, Flora 14 (1831) 526; Bijdr. Nat. Wet. 6 (1831) 267. — *Pharmacum papetarium* Rumph. [Hb. Amb. 4 (1750) 134, t. 69.] ex O. Ktze, Rev. Gen. Pl. 1 (1891) 248. — *Lectotype*: *Forsten s.n.* (L, holo, no. 908.129-613; iso: -624) (here appointed), Ambon, Laha, 1842.

Distribution. Moluccas: Ternate, Ceram, Ambon.

Habitat. Primary forests, often in exposed places; 200–1000 m.

24. *Astronia papuana* Cogn.

Astronia papuana Cogn. in DC., Monogr. Phan. 7 (1891) 1095. — *Pharmacum papuanum* O. Ktze, Rev. Gen. Pl. 3 (1898) 954. — T y p e: *Beccari PP 866* (G, holo; FI), Irian Jaya, Vogelkop Prov., Mt Arfak, Putat.

Distribution. New Guinea, Irian Jaya: Vogelkop Prov.

Habitat. Between 333–666 m.

25. *Astronia rostrata* Maxw.

Astronia rostrata Maxw., nom. nov. — *Astronia papetaria* Blume var. *novoguineensis* Merr. & Perry, J. Arn. Arbor. 24 (1943) 434. — T y p e: *Brass 13454* (A, holo; L), Irian Jaya, Jayapura Prov., 4 km SW of Bernhard Camp, Idenburg River, 900 m, March 1939.

Distribution. New Guinea, Irian Jaya: Jayapura Prov.

Habitat. Rain forest (e.g. with *Agathis*), 750–900 m.

26. *Astronia rugata* Maxw., spec. nov.

Astronia hollrungii Cogn. proxima. Arbor 12–20 m alta. Ramuli acute quadrangulares 3–4 mm diam. glabri costis lenticellatis. petioli 14–27 mm longi glabri. Laminae subcoriaceae oblongae ad lanceolatae 9,5–13 cm longae 2,5–6 cm latae, basi acuto, marginibus distaliter revolutis, apice acuminato, costa uno pare nervorum basin vel raro usque ad 2 mm supra basin orienti, pare inframarginali tenuissimo, supra glabra, infra sparsissime minutissime lepidotae. Inflorescentiae paniculatae 3–11 cm longae, axibus acute quadrangulatis sparse furfuraceae lepidoti. Flores 5-meri staminati tantum. Calyx sparse furfuraceo-lepidotus, tubo campanulato 1,25–1,5 mm longo, lobis late rotundatis 0,5–0,75 mm longis saepe externe rugosis cuspidatis. Stamina subaequalia, antheribus 1,25–1,5 mm longis. Stylus 2–2,5 mm longus, stigmata globoso c. 1 mm diam. — T y p u s: *Darbyshire 8944* (SING, holo; E, L, LAE), Papua New Guinea, Central Prov., Kairuki Subdist, 0.5 mile W of Maipa airstrip, primary forest, 160 m alt., 6 September 1962.

Tree, 12–20 m high. Branchlets acutely quadrangular, 3–4 mm diam., glabrous, ribs lenticellate. Petioles 14–27 mm long, glabrous. *Blades* subcoriaceous, oblong to lanceolate, 9.5–13 by 2.5–6 cm, base acute, margins distally revolute, apex acuminate, midrib with one pair of nerves at base or, rarely, up to 2 mm above it, inframarginal pair very thin, upper surface glabrous, lower surface very sparsely and minutely lepidote. *Inflorescences* paniculate, 3–11 cm long, axes acutely quadrangular, sparsely furfuraceous lepidote. *Flowers* 5-merous, staminate ones seen only. Calyx sparsely furfuraceous lepidote, tube campanulate, 1.25–1.5 mm long, lobes broadly rounded, 0.5–0.75 mm long, usually rugose outside, cuspidate. *Stamens* subequal, anthers 1.25–1.5 mm long. Style 2–2.5 mm long, stigma globose, c. 1 mm diam.

Distribution. Papua New Guinea: W Sepik, Central, and Milne Bay Prov.

Habitat. Primary forests; 0–150 m.

27. *Astronia rugosa* Maxw., spec. nov.

Frutex vel arbor usque ad 6 m alta. Ramuli acute quadrangulares 6–7 mm diam. dense conspicue pallide brunnee lepidoti squamose glabrescentes. Petioli 3–5 cm longi, squamose lepidoti. Laminae subcoriaceae oblongae 15–24,5 cm longae 4,5–10 cm latae, basi cuneato, margine plano, apice ab-

rupte breviter acuto ad cuspidato, costa uno pare nervorum 5–8 mm supra basin orienti, pare inframarginali tenui, supra glabrae, infra dense pallide brunnee lepidotae, squamulis evidētis (10 ×) venatione secūndario non obscurantibus. Inflorescentiae terminales erectae paniculatae 7,5–12 cm longae, axibus acute quadrangulatis, dense squamulis conspicuis pallide brunneis tectis demum squamose deciduis et texturo rugoso gaudētib. Flores 5-meri staminati bisexualesque. Calyx dense pallide brunnee lepidotus rugosus (i.s.). Flores staminati: tubus calycis campanulatus c. 3 mm longus, lobis late rotundatis c. 1 mm longis cuspidatis. Stamina subaequalia, filamentis c. 2 mm longis, antheribus oblongis, c. 2 mm longis. Stylus stigmaque adsunt ovarium deest. Flores bisexuales: tubus calycis depresso pyriformis c. 3 mm longus c. 6 mm diam., lobis obtuse triangularibus c. 1,5 mm longis. Ovarium 3- vel 4-loculare. Capsulae seminaque non vidi. — *T y p u s*: *Craven & Schodde 1084* (L, holo; A, BRI, CANB, K, LAE, SGO), Papua New Guinea, Morobe Prov., near Haumga, 1585 m alt., 30 March 1966.

Shrub or tree up to 6 m tall. Branchlets acutely quadrangular, 6–7 mm diam., densely and conspicuously light brown lepidote, flakingly glabrescent. Petioles 3–5 cm long, flakingly lepidote. *Blades* subcoriaceous, oblong, 15–24.5 by 4.5–10 cm, base cuneate, margin flat, apex abruptly shortly acute to cuspidate, midrib with one pair of nerves 5–8 mm above the base, inframarginal pair thin, upper surface glabrous, lower surface densely pale brown lepidote, scales visible (10 ×), not obscuring the secondary venation. *Inflorescences* terminal, paniculate, 7.5–12 cm long, axes acutely quadrangular, densely lepidote with conspicuous pale brown scales which flake off leaving a rough texture. *Flowers* 5-merous, staminate and bisexual. Calyx densely light brown lepidote, rugose (i.s.). *Staminate flowers*: calyx tube campanulate, c. 3 mm long, lobes broadly rounded, c. 1 mm long, cuspidate. *Stamens* subequal, filaments c. 2 mm long, anthers oblong, c. 2 mm long. Style and stigma present, ovary absent. *Bisexual flowers*: calyx tube depressed pyriform, c. 3 mm long by 6 mm diam., lobes bluntly triangular, c. 1.5 mm long. *Ovary* 3- or 4-locular. Capsules and seeds not seen.

Distribution. Papua New Guinea: Morobe Prov.

Habitat. Lower montane forests; 1700–1800 m.

28. *Astronia sericea* Maxw., *spec. nov.*

Arbor 20–22 m alta, caule striato 7 m longo 40 cm diam. Ramuli quadrangulares 4–5 mm diam. dense appresse argenteo-cineree ad tannee lepidoti. Petioli 18–49 mm longi plerumque glabri. Laminae subcoriaceae ellipticae ad oblongae 9,5–17,5 cm longae 4,5–7,5 cm latae, basi acuto ad cuneato, marginibus distaliter revolutis, apice acuminato, costa uno pare nervorum 2–5 mm supra basin orienti, pare inframarginali tenuissimo, supra glabrae, infra pubescentia ut in ramulis. Inflorescentiae paniculate cymosae multiflorae 6,5–7 cm longae, axibus quadrangularibus ad complanatis initio pubescentia ut in ramulis demum sparse lepidotis. Pedicelli 2,5–4 mm longi. Flores 5-meri staminati bisexualesque (alabastra tantum). Flores staminati: calyx sparse lepidoti fere glabri, tubo campanulato c. 2 mm longo, lobis late rotundatis 0,75–1 mm longis minute cuspidatis. Petala suborbicularia c. 2,25 mm longa c. 2,75 mm lata, basi unguiculato, apice obtuso, crenea demum alba. Stamina subaequalia, antheribus dolabriformibus c. 1,25 mm longis. Stylus c. 2 mm longus, stigmatē capitato c. 1 mm diam. Flores bisexuales: calyx tenuiter lepidotus, tubo urceolato c. 3,75 mm longo cristis sulcisque longitudinalibus prominentibus, lobis triangularibus c. 1,25 mm longis acutis. Petala late elliptica c. 2 mm longa c. 3,5 mm lata, basi unguiculato, apice rotundato. Stamina subaequalia, antheribus linearibus 1,5–1,75 mm longis. Stylus c. 1,5 mm longus, stigmatē capitato c. 1 mm diam. sulcato. Ovarium 3-loculare. Capsulae seminaque non vidi. — *T y p u s*: *Hoogland 4496* (US, holo; CANB, L), Papua New Guinea, Northern Prov., near Lake Ridubidubina, mountain rain forest, c. 750 m alt., 10 August 1954.

Tree, 20–22 m high, bole fluted, 7 m tall, 40 cm diam. Branchlets quadrangular, 4–5 mm diam., densely appressed silvery grey to tan lepidote. Petioles 18–49 mm long, usually glabrous. *Blades* subcoriaceous, elliptic to oblong, 9.5–17.5 by 4.5–7.5 cm, base acute to cuneate, margins distally revolute, apex acuminate, midrib with one pair of nerves from 2–5 mm above the base, inframarginal pair very thin, upper surface glabrous, lower surface pubescent as the branchlets. *Inflorescences* paniculate cymose, many-flowered, 6.5–7 cm long, axes quadrangular to compressed, initially pubescent as the branchlets, later sparsely so. Pedicels 2.5–4 mm long. *Flowers* 5-merous, staminate and bisexual (buds only). *Staminate flowers*: calyx sparsely lepidote, nearly glabrous, tube campanulate, c. 2 mm long, lobes broadly rounded, 0.75–1 mm long, minutely cuspidate. Petals suborbicular, c. 2.25 by 2.75 mm, base clawed, apex obtuse, cream, later white. *Stamens* subequal, anthers axe-shaped, c. 1.25 mm long. Style c. 2 mm long, stigma capitate, c. 1 mm diam. *Bisexual flowers*: calyx thinly lepidote, tube urceolate, c. 3.75 mm long, with prominent longitudinal ridges and grooves (i.s.), lobes triangular, c. 1.25 mm long, acute. Petals broadly elliptic, c. 2 by 3.5 mm, base clawed, apex rounded. *Stamens* subequal, anthers linear, 1.5–1.75 mm long. Style c. 1.5 mm long, stigma capitate, c. 1 mm diam., grooved. *Ovary* 3-locular. Capsules and seeds not seen.

Distribution. Papua New Guinea: Northern Prov.

Habitat. Montane rain forests; 750–1230 m.

29. *Astronia shungolensis* Maxw., *spec. nov.*

Arbor ad 14 m alta, caule gracili c. 7 m longo 15 cm diam. Ramuli obtuse quadrangulares c. 4 mm diam, sparse minute furfuraceae lepidoti glabrescentes, rugosi (i.s.). Petioli 1–2.5 cm longi, dorsaliter late sulcati, sparse furfuraceae lepidoti glabrescentes. Laminae subcoriaceae lanceolatae ad oblanceolatae 6–15 cm longae 1.7–4 cm latae, basi acuto, marginibus planis, apice acuto, costa uno pare nervorum c. 2 mm supra basin orienti, pare inframarginali obscurissime, supra glabrae, triste virides demum atrobrunneae (i.s.), infra dense minute brunnee lepidotae. Inflorescentiae paniculatae patentes ad 10 cm longae, axibus quadrangularibus saepe complanatis bisulcatis furfuraceae lepidotis. Flores 5-meri staminati tantum. Calyx dense furfuraceae lepidotus, tubo campanulato c. 2.5 mm longo, lobis triangularibus c. 0.5 mm longis acutis. Petala suborbicularia c. 2.5 mm longa c. 3 mm lata, basi unguiculato, apice rotundato, rubello. Stamina subaequalia, filamentis infra basin antheris affixis, antheribus ellipsoideis c. 1.5 mm longis (in alabastro), oppositipetalibus postice lobo complanato, alternipetalibus postice rotundatis. Stylus c. 4 mm longus (in alabastro), stigmatibus globosis c. 1 mm diam. Pistillodium nullum. Capsulae seminaeque non vidi. — *T y p u s*: NGF 45392 (*Kairo*) (SING, holo; L, LAE), Papua New Guinea, Morobe Prov., track to Shungol, montane forest, 1980 m alt., 19 August 1970.

Tree, up to 14 m high, bole slender, c. 7 m tall by 15 cm diam. Branchlets obtusely quadrangular, c. 4 mm diam., sparsely minutely furfuraceous lepidote, glabrescent, wrinkled (i.s.). Petioles 1–2.5 cm long, dorsally widely grooved, sparsely furfuraceous lepidote, glabrescent. *Blades* subcoriaceous, lanceolate to oblanceolate, 6–15 by 1.7–4 cm, base acute, margins flat, apex acute, midrib with one pair of nerves from c. 2 mm above the base, inframarginal pair very obscure, upper surface glabrous, dull green becoming dark brown (i.s.), lower surface densely minutely brown lepidote. *Inflorescences* paniculate, spreading, up to 10 cm long, axes quadrangular, often complanate and bisulcate, furfuraceous lepidote. *Flowers* 5-merous,

staminate ones seen only. Calyx densely furfuraceous lepidote, tube campanulate, c. 2.5 mm long, lobes triangular, c. 0.5 mm long, acute. Petals suborbicular, c. 2.5 by 3 mm, base clawed, apex rounded, reddish. *Stamens* subequal, filaments attached below the base of the anthers, these ellipsoid, c. 1.5 mm long (in bud), the opposit-petalous ones with a flattened posterior lobe, alternipetalous ones posteriorly rounded. Style c. 4 mm long (in bud), stigma globose, c. 1 mm diam. *Ovary* absent. Capsules and seeds not seen.

Distribution. Papua New Guinea: Morobe Prov.

Habitat. Montane forests; c. 2200 m.

Note. This species is distinct by its lanceolate to oblanceolate blades, the midrib with a pair of nerves from c. 2 mm above the base, underneath densely lepidote, and staminate flowers with triangular acute calyx lobes. *Astronia glomerata* Mansf. var. *glomerata* is similar in many respects, but the calyx lobes of the staminate flowers are broadly rounded and cuspidate. *Astronia macrantha* Maxw. has similar calyx lobes, but differs by the branchlets and inflorescence axes with their floccose furfuraceous indument mixed with furfuraceous and barbed bristles.

30. *Astronia sorongensis* Maxw., *spec. nov.*

Arbor 7–15 m alta. Ramuli obtuse quadrangulares 5–6 mm diam. sparse minute brunnee furfuraceo-lepidote glabrescentes. Petioli 4–6 cm longi c. 4 mm diam. anguste vadosae sulcati sparse furfuracei. Laminae subcoriaceae ellipticae ad oblongae 16–34 cm longae 8–14.5 cm latae, basi rotundato ad cordato, apice acuminato ad rostrato, costa basin uno pare nervorum, pare inframarginali tenui, supra glabrae, infra sparsissime brunnee furfuraceo-lepidotae. Inflorescentiae paniculatae, axis quadrangularibus ad applanatis dense atro-brunnee furfuraceo-lepidotis. Flores 5-meri staminati bisexualesque. Calycis tubus dense atro-brunnee furfuracee lepidotus non cristatus nec sulcatus, lobis tubo multo crassioribus. Flores staminati: tubus calycis campanulatus c. 3 mm longus (in alabastro), lobis late rotundatis c. 0.5 mm longis. Stylus stigmaque bene evolutum. Flores bisexuales: tubus calycis urceolatus c. 2.5 mm longus, lobis patentibus late triangularibus c. 1.5 mm longis incrassatis carinatis rugosis. Ovarium 4- vel 5-loculare. Capsulae seminaeque non vidi. — *T y p u s*: *Pleyte* 440 (SING, holotype; A, BO, L), Irian Jaya, Vogelkop Prov., Sorong, near Remu, 30 July 1948.

Tree, 7–15 m high. Branchlets bluntly quadrangular, 5–6 mm diam., sparsely minutely brown furfuraceous lepidote, glabrescent. Petioles 4–6 cm long by c. 4 mm diam., narrowly shallowly grooved, sparsely furfuraceous. *Blades* subcoriaceous, elliptic to oblong, 16–34 by 8–14.5 cm, base rounded to cordate, apex acuminate to rostrate, midrib with one pair of nerves at base, inframarginal pair thin, upper surface glabrous, lower surface very sparsely brown furfuraceous lepidote. *Inflorescences* paniculate, length unknown (fragments only), axes quadrangular to compressed, densely dark brown furfuraceous lepidote. *Flowers* 5-merous, staminate or bisexual. Calyx tube densely dark brown furfuraceous lepidote, not ridged nor grooved. *Staminate flowers*: calyx tube campanulate, c. 3 mm long (in bud), lobes broadly rounded, c. 0.5 mm long, much thicker than the tube. Style and stigma well-developed. *Bisexual flowers*: calyx tube urceolate, c. 2.5 mm long, lobes spreading, broadly triangular, c. 1.5 mm long, thickened, keeled, rugose. *Ovary* 4- or 5-locular. Capsules and seeds not seen.

Distribution. New Guinea, Irian Jaya: Vogelkop Prov.

Habitat. Lowland primary forest; c. 50 m.

31. *Astronia spectabilis* Blume

Astronia spectabilis Blume, Bijdr. 17 (1826) 1080. — *Pharmacum spectabile* O. Ktze, Rev. Gen. Pl. 1 (1891) 248. — Type: *Blume 459* (L, holo, no. 906.362-87), Java, G. Gedeh, waterfalls. *Astronia intermedia* Blume, Mus. Bot. Lugd.-Bat. I, 1 (1849) 9. — *Astronia spectabilis* Blume var. *intermedia* Miq., Fl. Ind. Bat. 1 (1855) 567. — *Pharmacum intermedium* O. Ktze, Rev. Gen. Pl. 1 (1891) 248. — Type: *Blume s.n.* (L no. 908.129-634, iso: -635), Java.

Distribution. Java (West, Central, East), Bali.

Habitat. Primary forests; 1300–2350 m.

32. *Astronia squamosa* Maxw., *spec. nov.*

Arbor ad 27 m alta, caule 17 m longo 30 cm diam. Ramuli quadrangulares 6–7 mm diam. dense brunnei furfuraceo-lepidoti squamose glabrescentes. Petioli 1–2,5 cm longi. Laminae coriaceae oblongae 5,5–11 cm longae 2,2–4,5 cm latae, basi acuto ad cuneato, marginibus distaliter revolutis, apice obtuso, costa basin uno pare nervorum, pare inframarginali tenui, supra glabrae brunnescentiter scabraeque (i.s.), infra sparse furfuraceo-lepidotae. Inflorescentiae terminales cymosae ad 5,5 cm longae, axibus quadrangularibus pubescentia ut in ramulis. Flores 5-meri staminati tantum. Calyx dense brunneo-furfuraceus squamulis paucis, tubo campanulato c. 2 mm longo, lobis late rotundatis c. 0,75 mm longis cuspidatis. Stamina aequalia, antheribus ellipsoideis c. 1,25 mm longis (in alabastro). Stylus c. 3 mm longus, stigmate capitato c. 0,75 mm diam. Capsulae seminaeque non vidi. — Type: *Hoogland & Pullen 5941* (US, holo; CANB, L), Papua New Guinea, Western Highlands Prov., Mt Hagen, near Wankl, primary forest, 2150 m alt., 17 August 1956.

Tree, up to 26 m high, bole 17 m, 30 cm diam. Branchlets quadrangular, 6–7 mm diam., densely brown furfuraceous lepidote, flakingly glabrescent. Petioles 1–2.5 cm long. *Blades* coriaceous, oblong, 5.5–11 by 2.2–4.5 cm, base acute to cuneate, margins distally revolute, apex obtuse, midrib with one pair of nerves at the base, inframarginal pair thin, upper surface glabrous, brownish and scabrous (i.s.), lower surface sparsely furfuraceous lepidote, glabrescent. *Inflorescences* terminal, cymose, up to 5.5 cm long, axes quadrangular, pubescent as the branchlets. *Flowers* 5-merous, staminate ones seen only. Calyx densely brown furfuraceous and with a few scales, tube campanulate, c. 2 mm long, lobes broadly rounded, c. 0.75 mm long, cuspidate. *Stamens* equal, anthers ellipsoid, c. 1.25 mm long (in bud). Style c. 3 mm long, stigma capitate, c. 0.75 mm diam. Capsules and seeds not seen.

Distribution. Papua New Guinea, Western Highlands Prov.

Habitat. Mountain forests; c. 2150 m.

33. *Astronia stapfii* Koord.

Astronia stapfii Koord., Meded. Lands Plantentuin. 19 (1898) 466, 633. — Type: *Koorders 17851* (BO, holo; L), Celebes, Minahassa, Menado, Lolombulan, 700 m, 8 April 1895.

Distribution. Celebes (Minahassa, Malili), Moluccas (Ceram).

34. *Astronia triangularis* Maxw., *spec. nov.*

Arbor 6–12 m alta. Ramuli tereti c. 5 mm diam. dense conspicue squarose brunnee furfuracei glabrescentes. Petioli 2,5–3 cm longi lepidoti. Laminae subcoriaceae oblongae ad lanceolatae (13–

19–26 cm longae (4–)6.5–8.5 cm latae, basi cuneato, marginibus revolutis, apice acuminato ad rostrato saepe aristato ut videtur, costa uno pare nervorum 5–12 mm supra basin orienti, pare inframarginali tenui, supra glabrae, infra sparsissime lepidotae. Inflorescentiae paniculatae, 3–7 cm longae. Flores 5-meri bisexuales tantum. Calyx dense lepidotus, tubo campanulato c. 2.5 mm longo, lobis triangularibus c. 2 mm longis acutis. Ovarium 2-loculare. Capsulae urceolato-subglobosae, corpore c. 4.5 mm longo c. 7 mm diam., lobis 1.5–2 mm longis plerumque inflexis. Semina linearia c. 3 mm longa. — *T y p u s*: *BW 7501 (Versteegh)* (SING, holo; L, LAE, MAN), Irian Jaya, Geelvink Bay Prov., Biak I., Saribi, secondary forest on clay, c. 80 m alt., 17 December 1958.

Tree, 6–12 m high. Branchlets terete, c. 5 mm diam., densely and conspicuously squarrosely brown furfuraceous, glabrescent. Petioles 2.5–3 cm long, lepidote. *Blades* subcoriaceous, oblong to lanceolate, (13–)19–26 by (4–)6.5–8.5 cm, base cuneate, margins revolute, apex acuminate to rostrate, often apparently aristate, midrib with one pair of nerves 5–12 mm above the base, inframarginal pair thin, upper surface glabrous, lower surface very sparsely lepidote. *Inflorescences* paniculate, 3–7 cm long. *Flowers* 5-merous, bisexual flowers seen only. Calyx densely lepidote, tube campanulate, c. 2.5 mm long, lobes triangular, c. 2 mm long, acute. *Ovary* 2-locular. Capsules urceolate-subglobose, body c. 4.5 mm long by 7 mm diam., lobes 1.5–2 mm long, usually inflexed. Seeds linear, c. 3 mm long.

Distribution. New Guinea, Irian Jaya: Geelvink Bay Prov.; Papua New Guinea: Morobe, Milne Bay Prov.

Habitat. Primary and secondary forests; 80–365 m.

35. *Astronia truncata* Maxw., *spec. nov.*

Arbor ad c. 17 m alta. Ramuli obtuse quadrangulares demum tereti 4–5 mm diam. sparse minute lepidoti glabrescentes. Petioli 1–2 cm longi furfuracei glabrescentes. Laminae coriaceae oblongae 4.5–7 cm longae 1.5–3 cm latae, basi acuto, marginibus distaliter revolutis, apice obtuse acuto, costa basin uno pare nervorum, pare inframarginali inconspicuo ad obscurissimo, supra glabrae, infra costis principalibus sparse lepidotis. Inflorescentiae terminales anguste paniculatae pauciflorae ad 4 cm longae, axibus tenuibus quadrangularibus ad appressis sparse lepidotis. Flores 5-meri, staminati tantum. Calyx dense lepidoto-furfuraceus, tubo cupulato c. 2 mm longo, margine \pm truncato lobis sinibusque inconspicuis. Petala orbicularia c. 4 mm longa c. 4 mm lata alba. Stamina aequalia, antheribus ellipsoideis c. 2 mm longis postice appendiculo unciformi. Stylus stigmaque bene evolutum. — *T y p u s*: *Carr 13783* (SING, holo; L), Papua New Guinea, Central Prov., Owen Stanley Range, above the Gap, c. 2660 m alt., 14 December 1935.

Tree, up to c. 17 m high. Branchlets obtusely quadrangular, becoming terete, 4–5 mm diam., sparsely minutely lepidote, glabrescent. Petioles 1–2 cm long, sparsely furfuraceous, glabrescent. *Blades* coriaceous, oblong, 4.5–7 by 1.5–3 cm, base acute, margins distally revolute, apex bluntly acute, midrib with 1 pair of nerves at base, inframarginal pair inconspicuous to very obscure, upper surface glabrous, lower surface sparsely lepidote on the main nerves. *Inflorescences* terminal, narrowly paniculate, few-flowered, up to 4 cm long, axes thin, quadrangular to compressed, sparsely lepidote. *Flowers* 5-merous, staminate ones seen only. Calyx densely lepidote furfuraceous, tube cupular, c. 2 mm long, margin \pm truncate, lobes and sinuses inconspicuous. Petals orbicular, c. 4 by 4 mm, white. *Stamens* equal, anthers ellipsoid, c. 2 mm long, posteriorly with a hook-like appendage. Style and stigma well-developed.

Distribution. Papua New Guinea: Central Prov.
Habitat. Mountain forest; c. 2650 m.

36. *Astronia villosa-vaginata* Maxw., *spec. nov.*

Arbor 15–18 m alta. Ramuli quadrangulares costis lenticellatis indumento 3–4 mm crasso squamulis densis minutis brunneis furfuraceis glabrescentes. Petioli 2–4 cm longi c. 2 mm diam. dorsaliter vaginati sulco dense pallide brunneo villosa ceterum sparse furfuracei. Laminae chartaceae oblongae 12–23 cm longae 4.5–10 cm latae, basi acuto, marginibus distaliter applanatis, apice acuminato, costa basin uno pare nervorum, pare inframarginali tenui, supra glabrae, infra squamulis dispersis demum glabrae. Inflorescentiae paniculatae c. 8 cm longae, axibus quadrangularibus moderate pallide brunneis farinoso-lepidotis. Flores 5-meri, staminati tantum. Calycis tubus campanulatus cristis sulcisque longitudinalibus 10, c. 1.5 mm longus moderate pallide brunnee farinose lepidotus, lobis late rotundatis c. 0.75 mm longis apiculatis tubo crassioribus rugosis. Stamina aequalia, antheribus c. 1 mm longis (in alabastro). Stylus stigmaque bene evolutum. — **T y p u s:** *Jacobs 9227* (L, holo; US, Z), Papua New Guinea, Western Highlands Prov., near Waro airstrip, 20 km SSW of Kutubu, primary forest, limestone area, 500–600 m alt., 14 October 1973.

Tree, 15–18 m. Branchlets quadrangular, ribs lenticellate, indument 3–4 mm thick, of dense, minute, brown, furfuraceous scales, glabrescent. Petioles 2–4 cm long by c. 2 mm diam., with a pale brown, densely villous and vaginate dorsal groove, otherwise sparsely furfuraceous. *Blades* chartaceous, oblong, 12–23 by 4.5–10 cm, base acute, margins distally flat, apex acuminate, midrib with 1 pair of nerves at base, inframarginal pair thin, upper surface glabrous, lower surface with scattered scales, finally usually glabrous. *Inflorescences* paniculate, c. 8 cm long, axes quadrangular, moderately light brown farinose lepidote. *Flowers* 5-merous, staminate ones seen only. Calyx tube campanulate, with 10 longitudinal ridges and grooves, c. 1.5 mm long, moderately pale brown, farinose, lepidote, lobes broadly rounded, c. 0.75 mm long, apiculate, thicker than the tube, rugose. *Stamens* equal, anthers c. 1 mm long (in bud). Style and stigma well-developed.

Distribution. Papua New Guinea: Western Highlands Prov.

Habitat. Primary forest on limestone; 500–600 m.

Astronia Blume section *Astigmata* Maxw., *sect. nov.*

Flos staminatus plerumque sine stylo seu ubi adest tum plerumque debiliter evoluta quam calycis tubo brevior et sine stigmate. Ovarium capsulaque 2-locularis. — **T y p u s:** *Astronia pulchra* Vidal.

Staminate flower usually without a style, or, when present, then usually as a poorly developed one, shorter than the calyx tube, and without a stigma. Ovary and capsule 2-locular.

Distribution. Andaman & Nicobar Islands, Burma, Malay Peninsula, Borneo, the Philippines, Taiwan.

37. *Astronia acuminatissima* Merr.

Astronia acuminatissima Merr., Philip. J. Sc., Bot. 8 (1913) 345. — **T y p e:** *Philip. Pl. 357* (*Ramos*) (PNH, holo, not extant; US), Philippines, Luzon, Rizal, San Isidro, June 1910.

Astronia parvifolia Merr., Philip. J. Sc., Bot. 8 (1913) 351. — Type: BS 14682 (Ramos) (PNH, holo, not extant; BO, L, MO, US), Philippines, Camiguin de Mindanao, 24 March 1912.

Astronia sorsogonensis Merr., Philip. J. Sc., Bot. 11 (1916) 26. — Type: BS 23699 (Ramos) (PNH, holo, not extant; A, BO, L, SING, US), Philippines, Luzon, Sorsogon, Mt Kililibong, 1000 m, 16 August 1915.

a. var. acuminatissima.

Distribution. Philippines: Mindoro, Luzon, Leyte, Mindanao.

Habitat. Primary forest, often mossy; 400–1190 m.

b. var. palawanensis Maxw., var. nov.

Var. *acuminatissimae* similis, laminis uno pare nervorum 0–2 mm supra basin orienti glabris, calycis tubo florum staminatorum paulo longioribus (1–1.25 mm longis) sinibus late U-formibus. — Type: PNH 8 (*Edaño*) (SING, holo; L, PNH), Philippines, Palawan, Mt Mantalingahan, 935 m alt., 7 May 1947.

Similar to var. *acuminatissima*, differing by: blades with one pair of nerves up to 2 mm above the base of the midrib, glabrous, calyx tubes of the staminate flowers slightly longer (1–1.25 mm long) with broadly U-shaped sinuses.

Distribution. Philippines: Palawan.

Habitat. Primary forest; c. 930 m.

c. var. subcaudata (Merr.) Maxw., stat. nov.

Astronia subcaudata Merr., Philip. J. Sc., Bot. 8 (1913) 349. — Type: BS 9457 (Robinson) (PNH, holo, not extant), Philippines, Luzon, Tayabas, Infanta, Mt Binuang, 800 m, 29 August, 1909.

Distribution. Philippines: Luzon, Catanduanos, Samar, Biliran, Leyte, Mindanao, Camiguin I.

Habitat. Primary forests (often with dipterocarps); 150–800 m.

38. *Astronia alata* Maxw., spec. nov.

Arbor 12–15 m alta, caule ad 20 cm diam. Ramuli robusti acute quadrangulares plerumque alati 8–12 mm diam. sparse furfuraceo-lepidoti. Petioli dorsaliter 2-alati 3.5–9.5 cm longi pubescentia ut in ramulis. Laminae coriaceae oblongae 24–29 cm longae 12–15 cm latae, basi cuneato, marginibus planis, apice acuto abrupte cuspidato, costa uno pare nervorum 5–9 mm supra basin orienti, pare inframarginali tenuiore, supra glabrae, infra dense minute persistentiter glaucae pallide brunnee lepidoti nervis principalibus squamulis maioribus. Inflorescentiae terminales paniculatae c. 24 cm longae, axibus ramulis similibus. Flores 5-meri, staminati tantum. Calyx campanulatus c. 2.5 mm longus, lobis triangularibus c. 2 mm longis lobis acutis. Petala obovata, c. 3.5 mm longa c. 3 mm lata, basi unguiculato, apice rotundato. Stamina subaequalia, antheribus suborbicularibus 1.75–2 mm diam. Stylus stigmaque n.v. Capsulae globosae c. 4 mm diam. 2-loculare. Semina linearia 2.5–3 mm longa. — Type: BS 40598 (Ramos & *Edaño*) (A, holo; L), Philippines, Mindoro, Mt Halcon, March 1922.

Tree, 12–15 m high, bole up to 20 cm diam. Branchlets robust, acutely quadrangular, usually winged, 8–12 mm diam., sparsely furfuraceous lepidote. Petioles

dorsally 2-winged, 3.5–9.5 cm long, pubescent as the branchlets. *Blades* coriaceous, oblong, 24–29 by 12–15 cm, base cuneate, margins flat, apex acute, abruptly cuspidate, midrib with one pair of nerves from 5–9 mm above the base, inframarginal pair thinner, upper surface glabrous, lower surface densely, minutely, persistently, wax-like, pale brown lepidote, main nerves with larger scales. *Inflorescences* terminal, paniculate, c. 24 cm long, axes as the branchlets. *Flowers* 5-merous, staminate ones seen only. Calyx campanulate, c. 2.5 mm long, lobes triangular, c. 2 mm long, acute. Petals obovate, c. 3.5 by 3 mm, base unguiculate, apex rounded. *Stamens* subequal, anthers suborbicular, 1.75–2 mm diam. Style and stigma not seen. Capsules globose, c. 4 mm diam., 2-locular. Seeds linear, 2.5–3 mm long.

Distribution. Philippines: Mindoro.

Habitat. Mossy montane forest; c. 1800 m.

Vernacular name. Bagaobao.

Note. Used for construction timber.

39. *Astronia apoensis* Elmer

Astronia apoensis Elmer, Leaf. Philip. Bot. 4 (1911) 1206. — *Type:* Elmer 11427 (PNH, holo, not extant; A, BO, E, L, US, Z), Philippines, Mindanao, Davao, Todaya, Mt Apo, 1675 m, August 1909.

Astronia mearnsii Merr., Philip. J. Sc., Bot. 8 (1913) 340. — *Type:* FB 4699 (Mearns & Hutchinson) (PNH, holo, not extant; US), Philippines, Mindanao, Misamis, Mt Malindang, 1800 m, May 1906.

Distribution. Philippines: Mindanao.

Habitat. Mountain forests, often along streams; 1800–2065 m.

40. *Astronia benguetensis* Maxw., *spec. nov.*

Habitus ignotus 2–3 m altus caule c. 4 cm diam. Ramuli obtuse quadrangulares 5–6 mm diam. moderate appresse minute cineree lepidoti, nodis sine maculis circularibus. Petioli 1,5–3 cm longi 4–5 mm diam. furfuraceo-lepidoti, dorsaliter squamis deciduis. Laminae coriaceae suborbiculares ad oblongae 8,5–18 cm longae 4–14 cm latae, basi acuto, marginibus planis, apice obtuso ad obtuse acuto, costa basin uno vel duobus paribus nervorum, pare inframarginali tenuiore, supra glabrae, infra dense appresse minute brunnee lepidotae glabrescentes. Flores n.v. Infructescentiae terminales paniculatae 18–19 cm longae, axibus ramulis similibus. Capsulae subglobosae c. 3 mm longae c. 4 mm diam. dense appresse cineree lepidotae, lobis triangularibus c. 0,5 mm longis, sinibus late curvatis, 2-loculares. Semina linearia 2–2,25 mm longa. — *Type:* Celestino 4381 (L, holo; A), Philippines, Luzon, Mountain Prov., Benguet Subprov., Mt Pulog, Bukod, 2000 m alt., 13 March 1948.

Habit unknown, 2–3 m high, bole c. 4 cm diam. Branchlets bluntly quadrangular, 5–6 mm diam., moderately appressed, minute, grey lepidote, nodes without circular patches. Petioles 1.5–3 cm long by 4–5 mm diam., furfuraceous lepidote, dorsally with deciduous scales. *Blades* coriaceous, suborbicular to oblong, 8.5–18 by 4–14 cm, base acute, margins flat, apex obtuse to bluntly acute, midrib with one or 2 pairs of nerves at base, inframarginal pair thinner, upper surface glabrous, the lower surface densely, appressed, minute, brown lepidote, glabrescent. *Flowers* not seen. *Infructescences* terminal, paniculate, 18–19 cm long, axes as the branchlets.

Capsules subglobose, c. 3 mm long by 4 mm diam., densely appressed greyish lepidote, lobes triangular, c. 0.5 mm long, acute, sinuses broadly curved, 2-locular. Seeds linear, 2–2.25 mm long.

Distribution. Philippines: Luzon.

Habitat. Forest near creek; c. 2000 m.

41. *Astronia candolleana* Cogn.

Astronia candolleana Cogn. in DC., Monogr. Phan. 7 (1891) 1099. — *Pharmacum candolleianum* O. Ktze, Rev. Gen. Pl. 3 (1898) — Type: *Cuming* 850 (E, L, MO; G, LE, n.v.), Philippines, Luzon, Prov. Albay, A° 1837.

Astronia platyphylla Merr., Philip. J. Sc., Bot. 8 (1913) 355. — Type: *BS 16545 (Ramos)* (PNH, holo, not extant; BO, L, US), Philippines, Luzon, Laguna, San Antonio, 2 October 1912.

Astronia tetragona Merr., Philip. J. Sc., Bot. 12 (1917) 341. — Type: *FB 25204 (Alvarez)* (PNH, holo, not extant), Philippines, Mindanao, Lanao, Lanao-Cotabato trail, 1000 m, 21 March 1916.

Astronia zambalensis Elmer, Leaflet. Philip. Bot. 9 (1934) 3202. — Type: *Elmer 22065* (PNH, holo, not extant; A, BO, L, MO, SING, Z), Philippines, Luzon, Pampanga, Zambales Mts, Mt Pinatubo, 1220 m, May 1927.

Astronia bulusanensis Elmer, Leaflet. Philip. Bot. 10 (1939) 3653; nom. inval., no Latin. — Voucher: *Elmer 17036* (PNH, holo, not extant; A, BO, L, Z) (here appointed), Philippines, Luzon, Sorsogon, Irosin, Mt Bulusan, 610 m, November 1915.

Distribution. Philippines: Mindoro, Luzon, Panay, Mindanao.

Habitat. Primary forests, damp areas; lowlands to 1350 m.

42. *Astronia cumingiana* Vidal

Astronia cumingiana Vidal, Phan. Cuming. Philip. (1885) 174. — *Pharmacum cumingianum* O. Ktze, Rev. Gen. Pl. 3 (1898) 954. — Type: *Cuming* 999 (PNH, holo, not extant; E, L, MO), Philippines, Luzon, Prov. Albay ('Prov. Pangasana').

Astronia foxworthyi Elmer, Leaflet. Philip. Bot. 8 (1919) 3091. — Type: *Elmer 17964* (PNH, holo, not extant; A, BO, L, MO, US, Z), Philippines, Luzon, Laguna, Los Baños, middle elevation Mt Maquiling, June/July 1917.

a. var. *cumingiana*.

Distribution. Mindoro, Luzon, Negros, Mindanao.

Habitat. Primary and secondary forests at low to medium elevations.

Use. The leaves are mixed with oil to relieve stomach aches.

b. var. *bicolor* (Merr.) Maxw., stat. nov.

Astronia bicolor Merr., Philip. J. Sc., Bot. 8 (1913) 350. — Type: *FB 10851 (Curran)* (PN, holo, not extant), Philippines, Luzon, Benguet, Mt Ugo, 2000 m, 16 December 1908.

Astronia discolor Merr., Philip. J. Sc., Bot. 8 (1913) 352. — Type: *Loher 6270* (PNH, holo, not extant; US), Philippines, Luzon, Laguna, Mt Maquiling, April 1906.

Astronia maquilingensis Elmer, Leaflet. Philip. Bot. 8 (1919) 3092. — Type: *Elmer 17533* (PNH, holo, not extant; A, BO, L, MO, US, Z), Philippines, Luzon, Laguna, Los Baños, summit Mt Maquiling, June/July 1917.

Distribution. Philippines: Luzon, Mindanao.

Habitat. Primary forests; 300–2000 m.

43. *Astronia dioica* Merr.

Astronia dioica Merr., Philip. J. Sc., Bot. 8 (1913) 343. — **T y p e:** *BS 15293 (Ramos)* (PNH, holo, not extant), Philippines, Leyte, Mt Ibuni, near Dagami, August 1912.

Distribution. Philippines: Catanduanes, Samar, Leyte.

Habitat. Primary forests; up to 500 m.

44. *Astronia ferruginea* Elmer

Astronia ferruginea Elmer, Leaf. Philip. Bot. 4 (1911) 1205. — **T y p e:** *Elmer 11426* (PNH, holo, not extant; A, BO, E, L, MO, US, Z), Philippines, Mindanao, Davao, Todaya, Mt Apo, 1675 m, August 1909.

Astronia ferruginea Elmer var. *ampla* Merr., Philip. J. Sc., Bot. 8 (1913) 342. — **L e c t o t y p e:** *BS 18900 (Miranda)* (PNH, holo, not extant; L) (here appointed), Philippines, Basilan, Comalarang River, September 1912.

Distribution. Philippines: Luzon, Basilan, Mindanao.

Habitat. Primary forests; 500–2000 m.

45. *Astronia formosana* Kaneh.

Astronia formosana Kaneh., Form. Trees (1918) 258. — **T y p e:** *Kanehira 88* (TAIF, holo, n.v.; A), Taiwan, Kosyun, Mt Hiiran.

Distribution. Taiwan.

Habitat. Primary subtropical forests; 200–400 m.

Note. Contrary to Keng, J. Taiwan Mus. 8 (1955) 18, this is not a 'nomen subnudum': it has a Chinese description, which is valid, as it was published before 1935. — JFV.

46. *Astronia gitingensis* Elmer

Astronia gitingensis Elmer, Leaf. Philip. Bot. 4 (1911) 1202. — **T y p e:** *Elmer 12518* (PNH, holo, not extant; A, BO, E, L, MO, US, Z), Philippines, Sibuyan, Capiz, Magallanes, Mt Giting-giting, 1450 m, May 1910.

Distribution. Philippines: Sibuyan.

Habitat. Ridge in primary forest; c. 1600 m.

47. *Astronia glauca* Merr.

Astronia glauca Merr., Bull. Govt Lab. Philip. 29 (1905) 31. — **T y p e:** *Elmer 6294* (PNH, holo, not extant; SING, US), Philippines, Luzon, Benguet, Baguio, May 1904.

Distribution. Philippines: Luzon.

Habitat. Primary forests and thickets; 700–1600 m.

48. *Astronia katangladensis* Maxw., spec. nov.

Arbor 7–8 m alta, caule c. 15 cm diam. Ramuli tereti c. 5 mm diam. dense minute atro-brunnee furfuraceo-lepidoti rugosi (i.s.), nodis pulvinis pallidis circularibus verruciformibus in lateribus ambobus petioli vel ejus cicatricis. Petioli 10–25 mm longi pubescentia ut in ramulis. Laminae subcoriaceae oblongae 11–18 cm longae 4–6 cm latae, basi cuneato, marginibus planis, apex acuminato, costa uno pare nervorum supra basin 12–18 mm orienti, pare inframarginali tenui, nervis secundariis 8–12 mm inter se, supra glabrae, infra dense appresse plerumque persistentiter pallide brunnee lepidotae. Inflorescentiae terminales erectae thyrsoidae patentes 3–4,5 cm longae, axibus quadrangularibus ad compressis pubescentia ut in ramulis, nodis maculis verruciformibus. Flores 5-meri, bisexuales tantum. Calyx pubescentia ut in ramulis, tubo urceolato c. 2,5 mm longo, lobis triangularibus c. 0,5 mm longis acutis. Petala orbicularia c. 2,5 mm diam. basi minute unguiculato apice rotundata. Stamina subaequalia, filamentis aequilongis, antheribus oblongis 1–1,25 mm longis. Stylus c. 2 mm longus, stigmatibus capitato. Ovarium 2-loculare. Capsulae seminaeque n.v. — T y p u s: *PNH 9936 (Sulit)* (A, holo; L, PNH), Philippines, Mindanao, Bukidnon Subprov., Mt Katanglad, 1800 m alt., 27 February 1949.

Tree, 7–8 m high, bole c. 15 cm diam. Branchlets terete, c. 5 mm diam., densely, minutely, dark brown, furfuraceous lepidote, wrinkled (i.s.), nodes with pale circular wart-like patches on each side of the base of the petiole or its scar. Petioles 10–25 mm long, pubescent as the branchlets. *Blades* subcoriaceous, oblong, 11–18 by 4–6 cm, base cuneate, margins flat, apex acuminate, midrib with one pair of nerves from 12–18 mm above the base, inframarginal pair thin, secondary nerves 8–12 mm apart, upper surface glabrous, lower surface densely, appressed, usually persistent, light brown lepidote. *Inflorescences* terminal, erect, thyrsoid, spreading, 3–4.5 cm long, axes quadrangular to compressed, pubescent as the branchlets, nodes with wart-like patches. *Flowers* 5-merous, bisexual ones seen only. Calyx pubescent as the branchlets, tube urceolate, c. 2.5 mm long, lobes triangular, c. 0.5 mm long, acute. Petals orbicular, c. 2.5 mm diam., base slightly unguiculate, apex rounded. *Stamens* subequal, filaments equally long, anthers oblong, 1–1.25 mm long. Style c. 2 mm long, stigma capitate. *Ovary* 2-locular. Capsules and seeds not seen.

Distribution. Philippines: Mindanao.

Habitat. Mossy forest; c. 1800 m.

49. *Astronia lagunensis* Merr.

Astronia lagunensis Merr., Philip. J. Sc. 1, Suppl. (1906) 213. — T y p e: *Merrill 5144* (PNH, holo, not extant; US), Philippines, Luzon, Laguna, Mt Maquiling, 1100 m, 17 March 1906.

Astronia loheri Merr., Philip. J. Sc., Bot. 8 (1913) 341. — T y p e: *Loher 6294* (PNH, holo, not extant), Philippines, Luzon, Rizal, Angilog, March 1906.

Astronia consanguinea Merr., Philip. J. Sc., Bot. 12 (1917) 338. — T y p e: *BS 29215 (Ramos & Edaño)* (PNH, holo, not extant; A, US), Philippines, Luzon, Tayabas, Infanta-Siniloan trail, 12 June 1917.

Astronia verruculosa Merr., Philip. J. Sc., Bot. 12 (1917) 342. — T y p e: *Philip. Pl. 1569 (Ramos)* (PNH, holo, not extant; A, BO, L, MO, SING), Philippines, Luzon, Camarines, Mt Isarog, 1900 m, 23 November 1913.

Astronia pacifica Elmer, Leaflet. Philip. Bot. 10 (1939) 3654; nom. inval., no Latin. — Voucher: *Elmer 16526* (PNH, holo, not extant; A, BO, L, US, Z) (appointed here), Philippines, Luzon, Sorsogon, Irosin, Mt Bulusan, 915 m, July 1916.

a. var. lagunensis.

Distribution. Philippines: Luzon, Catanduanes, Samar, Panay.

Habitat. Primary forests, often along streams, or in wet, mossy areas; 350–2700 m.

Use. Used for house beams and other constructions.

b. var. pachyphylla (Merr.) Maxw., stat. nov.

Astronia pachyphylla Merr., Philip. J. Sc., Bot. 12 (1917) 339. — **Type:** BS 28558 (*Ramos & Edaño*) (PNH, holo, not extant; A, US), Philippines, Luzon, Tayabas, Mt Binuang, back of Infantes, 1000 m, May 1917.

Distribution. Philippines: Luzon.

Habitat. Mountain forests; c. 1000 m.

c. var. pauciflora (Merr.) Maxw., stat. nov.

Astronia pauciflora Merr., Philip. J. Sc., Bot. 14 (1919) 434. — **Type:** BS 28646 (*Ramos & Edaño*) (PNH, holo, not extant; A, BO, US), Philippines, Luzon, Tayabas, Mt Binuang, back of Infanta, 1000 m, May 1917.

Astronia brachybotrys Merr., Philip. J. Sc., Bot. 14 (1919) 434. — **Type:** BS 33279 (*Ramos*) (PNH, holo, not extant; BO, L), Philippines, Luzon, Ilocos Norte, Mt Palimlim, 1000 m, 21 August 1918.

Distribution. Philippines: Luzon.

Habitat. Mountain forests, often in mossy areas; c. 1000 m.

50. *Astronia megalantha* Merr.

Astronia megalantha Merr., Philip. J. Sc., Bot. 8 (1913) 347. — **Type:** BS 15258 (*Ramos*) (PNH, holo, not extant; US), Philippines, Leyte, near summit of Mt Burauí, near Dagami, 13 August 1912.

Astronia negrosensis Merr., Philip. J. Sc., Bot. 8 (1913) 348. — **Type:** FB 4298 (*Everett*) (PNH, holo, not extant; US), Philippines, Negros, Iruioagaan River, 150 m, June 1906.

a. var. megalantha.

Distribution. Philippines: Luzon, Samar, Leyte, Cebu, Negros, Mindanao (incl. Bucas Grande), Leyte.

Habitat. Primary forests; 100–1300 m.

b. var. campanulata Maxw., var. nov.

A var. *megalantha* differt in laminis ovatis plerumque latoribus (ad 10,5 cm), costa basin uno pare nervorum orienti, calycis tubo florum staminatorum campanulato c. 3 mm longo, lobis triangularibus c. 1,5 mm longis, pistillodio minuto. Pubescentia laminarum, flores bisexuales, capsulaeque in var. *megalantha* eadem. — **Type:** BS 38670 (*Ramos & Edaño*) (A, holo; US), Philippines, Mindanao, Bukidnon Subprov., Mahilucot River, June/July 1920.

Differs from var. *megalantha* by: Blades ovate, usually wider (up to 10.5 cm), midrib with one pair of basal nerves. Staminate flowers with a campanulate calyx tube c. 3 mm long, lobes triangular, c. 1.5 mm long. Pistillode minute. The pubescence of the blades, the bisexual flowers, and the capsules are the same.

Distribution. Philippines: Mindanao.

Habitat. Not noted.

51. *Astronia meyeri* Merr.

Astronia meyeri Merr., Govt Lab. Publ., Philip. 35 (1905) 51. — **Type:** *FB 2840* (Meyer) (PNH, holo, not extant; BO, SING, US), Philippines, Luzon, Bataan Prov., Mt Mariveles, Lamao River, 22 November 1904.

Distribution. Philippines: Luzon, Samar, Panay.

Habitat. Primary and mossy forests, 300–1150 m.

Use. Bark yield tannins used in dyeing.

52. *Astronia pulchra* Vidal

Astronia pulchra Vidal, Rev. Pl. Vasc. Filip. (1886) 136. — *Pharmacum pulchrum* O. Ktze, Rev. Gen. Pl. 3 (1898) 954. — **Type:** *Vidal 345* (PNH, holo, not extant; A, L), Philippines, Luzon, Camarines Sur, Mt Iriga.

Astronia cuernosensis Elmer, Leaflet. Philip. Bot. 4 (1911) 1204. — **Type:** *Elmer 10234* (PNH, holo, not extant; A, BO, E, L, MO, US, Z), Philippines, Negros, Negros Oriental, Dumaguete, Cuernos Mts, 1220 m, June 1908.

Astronia pulchra Vidal var. *obovata* Merr., Philip. J. Sc., Bot. 8 (1913) 350. — **Type:** *BS 5013* (Ramos) (PNH, holo, not extant; US), Philippines, Luzon, Zambales, Mt Tapulao, November 1907.

Astronia bicolorana Elmer, Leaflet. Philip. Bot. 10 (1939) 3651; nom. inval., no Latin. — **Voucher:** *Elmer 16107* (PNH, holo, not extant; A, L, MO, Z), Philippines, Luzon, Sorsogon, Irosin, Mt Bulusan, 610 m, May 1916.

Distribution. Philippines: Mindoro, Batanes, Luzon, Biliran, Leyte, Negros, Mindanao (incl. Camiguin I.).

Habitat. Mountain forests, often mossy; 550–2400 m.

53. *Astronia quadrangulata* Maxw., *spec. nov.*

Arbor 5–7 m alta, caule c. 20 cm diam. Ramuli acute quadrangulares 4–6 mm diam. plerumque demum plerumque glabri laeves pallide brunnei. Petioli 6–8 mm longi sparse furfuraceae lepidoti glabrescentes. Laminae subcoriaceae lanceolatae ad oblanceolatae 5–12.5 cm longae 1.75–3 cm latae, basi acuto ad cuneato, marginibus planis, apice acuto, costa uno pare nervorum supra basin c. 2 mm orienti, pare inframarginali tenuissimo, supra glabrae, infra dense appresse persistentiter brunnee lepidotae. Paniculae angustae 6.5–13 cm longae, axibus complanatis inferioribus vulgo glabris superioribus dense furfuraceae lepidotis. Flores 5-meri staminati bisexualesque alabastra tantum. Calycis tubo c. 3 mm longo c. 2.5 mm lato (in alabastro) dense furfuraceo-lepidoto, lobis triangularibus c. 1 mm longis acutis, staminatorum campanulatis bisexualium ± urceolatis. Stamina subaequalia. Ovarium 2-loculare. — **Type:** *Jacobs 7353* (SING, holo; A, L, MO), Philippines, Luzon, Mountain Prov., Mt Pulog, mossy primary forest bordering open grassland, on sandy loamy soil, 2500–2700 m, 6 February 1968.

Tree, 5–7 m high, bole c. 20 cm diam. Branchlets acutely quadrangular, 4–6 mm diam., usually finally glabrous and smooth, pale brown (i.s.). Petioles 6–8 mm long, sparsely furfuraceous lepidote, glabrescent. *Blades* subcoriaceous, lanceolate to oblanceolate, 5–12.5 by 1.75–3 cm, base acute to cuneate, margins flat, apex acute, midrib with one pair of nerves from c. 2 mm above the base, inframarginal pair very thin, upper surface glabrous, lower surface densely, appressed, persistent, brown (i.s.) lepidote. *Panicles* narrow, 6.5–13 cm long, axes flattened, the lower ones usually glabrous, the upper ones densely furfuraceous lepidote. *Flowers* 5-merous, staminate and bisexual, buds seen only. Calyx tube c. 3 mm long by 2.5 mm diam. (in bud), densely furfuraceous lepidote, lobes triangular, c. 1 mm long, acute, in staminate flowers campanulate, in bisexual ones \pm urceolate. *Stamens* subequal. *Ovary* 2-locular.

Distribution. Philippines: Luzon.

Habitat. Primary forest, mossy areas; 2250–2700 m.

54. *Astronia rolfei* Vidal

Astronia rolfei Vidal, Phan. Cuming. Philip. (1885) 174. — *Pharmacum rolfei* O. Ktze, Rev. Gen. Pl. 3 (1898) 954. — *Lectotype*: *Cuming 1723* (PNH, holo, not extant; K, L) (here appointed), Philippines, Samar I., 1837.

Astronia lucbanensis Elmer, Leaf. Philip. Bot. 4 (1911) 1201. — *Lectotype*: *Elmer 7807* (PNH, holo, non extant; A, BO, E, L, MO, US, Z) (here appointed), Philippines, Luzon, Tayabas, Lucban, Mt Banahao, 610 m, May 1907.

Astronia rolfei Vidal var. *furfuracea* Merr., Philip. J. Sc., Bot. 8 (1913) 345. — *Type*: *FB 17180 (Curran)* (PNH, holo, not extant; US), Philippines, Luzon, Cagayan, Misiones River.

Distribution. Philippines: Luzon, Catanduanes, Samar, Leyte, Negros, Mindanao.

Habitat. Mountain forests; c. 700 m.

55. *Astronia sabahensis* Maxw., *spec. nov.*

In respectibus multis *Astroniae smilacifoliae* Triana ex C.B. Clarke similis. Ramuli obscure triangulares tereti c. 3 mm diam. dense brunnee furfuraceo-lepidoti lenticellati. Laminae infra dense appresse plerumque persistentiter lepidotae. Inflorescentiae axes quadrangulares ad complanati pubescentia ut in ramulis. Calycis tubus eadem pubescentia, lobis triangularibus c. 0.5 mm longis acutis. Stamina aequalia vel fere, filamentis antice in antheribus prope loculos affixis, antheribus suborbicularibus c. 1.25 mm diam. Flores staminati: Calycis tubus cupulato-campanulatus c. 1.5 mm longus, lobis c. 0.5 mm longis. Flores bisexuales: Calycis tubus campanulato-urceolatus c. 3 mm longus. Ovarium 2-loculare. Capsulae seminaeque non vidi. — *Type*: *Clemens 32827* (A, holo; L), Sabah, Mt Kinabalu National Park, Mt Nunkok, 600–900 m alt., 17 April 1923.

Distribution. Sabah, Mt Kinabalu, G. Lontung, Bt. Permatang.

Habitat. Primary and secondary forests, often in mossy places; 700–1700 m altitude.

Note. In many respects similar to *Astronia smilacifolia* Triana ex C.B. Clarke. Branchlets obscurely quadrangular to terete, c. 3 mm diam., densely brown furfuraceous lepidote, lenticellate. Blades beneath densely, appressed, brown, usually per-

sistently lepidote. Inflorescence axes quadrangular to flattened, pubescent as the branchlets. Calyx tube with the same pubescence, lobes triangular, c. 0.5 mm long, acute. Stamens equal or nearly so, filaments attached anteriorly on the anthers near the locules, anthers suborbicular, c. 1.25 mm diam. Staminate flowers: Calyx tube cupular campanulate, c. 1.5 mm long, lobes c. 0.5 mm long. Bisexual flowers: Calyx tube campanulate urceolate, c. 3 mm long. Ovary 2-locular. Capsules and seeds not seen.

56. *Astronia scabrida* Maxw., *spec. nov.*

Arbor (?). Ramuli tereti 8–10 mm diam. sparse minute furfuraceo-lepidoti rugosi (i.s.), nodis ad basibus petiolorum lateribus ambobus maculo calloso 'khaki' colore. Petioli 3–5.5 cm longi dorsaliter vaginati sparse furfuracee lepidoti. Laminae subcoriaceae ovatae ad oblongae 10–17.5 cm longae 5–7.5 cm latae, basi rotundato, marginibus planis, apice acuto, costa basin duobus paribus nervorum, pare inframarginali tenuiore, supra glabrae laeves, infra disperse lepidotae minute papillose scabrae (i.s.). Inflorescentiae paniculatae 6–7 cm longae, axibus quadrangulatis ad complanatis sparse furfuracee lepidoti, nodis maculis callosis (fide clavis). Flores 5-meri staminati tantum. Calyx campanulatus, tubo c. 1.5 mm longo, lobis triangularibus c. 0.75 mm longis. Stamina subaequalia, antheribus oblongis, loculis in apice distali. Pistillodium minutum. — **T y p u s:** *BS 38555 (Ramos & Edaño)* (A, holo; L, US), Philippines, Mindanao, Bukidnon Subprov., Mt Lipa, June/July 1920.

Tree (?). Branchlets terete, 8–10 mm diam., sparsely minutely furfuraceous lepidote, wrinkled (i.s.), nodes at the base of the petioles on both sides with a wart-like khaki-coloured patch. Petioles 3–5.5 cm long, dorsally vaginate, sparsely furfuraceous lepidote. *Blades* subcoriaceous, ovate to oblong, 10–17.5 by 5–7.5 cm, base rounded, margins flat, apex acute, midrib with 2 pairs of nerves at the base, inframarginal pair thinner, upper surface smooth, glabrous, lower surface scattered lepidote, minutely papillose and scabrid (i.s.). *Inflorescence* paniculate, 6–7 cm long, axes quadrangular to flattened, sparsely furfuraceous lepidote. *Flowers* 5-merous, staminate ones seen only. Calyx campanulate, sparsely furfuraceous lepidote, tube c. 1.5 mm long, lobes triangular, c. 0.75 mm long. *Stamens* subequal, anthers oblong, locules on the distal tip. Pistillode minute.

Distribution. Philippines: Mindanao.

Habitat. Not noted.

57. *Astronia smilacifolia* Triana ex C.B. Clarke

Astronia smilacifolia Triana ex C.B. Clarke in Hook. f., *Fl. Br. Ind.* 2 (1879) 550. [— *Melastoma smilacifolium* Wallich, *Cat.* (1831) no. 4057. — *Astronia smilacifolia* Triana, *Trans. Linn. Soc.*, London 28 (1871) 152, nomen.] — *Pharmacum smilacifolium* O. Ktze, *Rev. Gen. Pl.* 3 (1898) 954. — **L e c t o t y p e:** *Porter in Wallich Cat.* 4057 (K, holo, n.v.) (here appointed), Penang.

Astronia smilacifolia C.B. Clarke var. *lepidophylla* Scortechini ex King, *J. As. Soc. Beng.* 69, 2 (1900) 67. — **L e c t o t y p e:** *Scortechini 1885* (CAL?, holo, n.v.; E, K, L, SING) (here appointed), Malaya, Perak.

Astronia steenisii Bakh. f., *Thesis* (1943) 305. — **T y p e:** *Van Steenis 1388* (L, holo; BO), Natuna I., Bunguran, S top of G. Bunguran, 950 m, 15 April 1928.

Distribution. Malay Peninsula (Perak, Trengganu, Malacca, Penang), Borneo (Sarawak, E Kalimantan, Natuna I.).

Habitat. Primary mountain forests, often in rocky places; (200–)1100–1350 m.

58. *Astronia viridifolia* Elmer

Astronia viridifolia Elmer, Leaflet. Philip. Bot. 4 (1911) 1203. — **Type:** *Elmer 12281* (PNH, holo, not extant; A, BO, E, L, MO, US, Z), Philippines, Sibuyan, Capiz, Magallanes, Mt Giting-giting, 305 m, April 1910.

Astronia wenzelii Merr., Philip. J. Sc., Bot. 8 (1913) 346. — **Type:** *Wenzel 204* (PNH, holo, not extant; A, E, US), Philippines, Leyte, Dagami, 19 June 1913.

Astronia purpuriflora Elmer, Leaflet. Philip. Bot. 10 (1939) 3656, nom. inval., no Latin. — **Voucher:** *Elmer 16350* (PNH, holo, not extant; A, BO, L, MO, US, Z), Philippines, Luzon, Sorsogon, Irosin, Mt Bulusan, 305 m, June 1916.

Distribution. Philippines: Mindoro, Luzon, Catanduanes, Sibuyan, Samar, Biliran, Leyte, Panay.

Habitat. Primary, often dipterocarp, forests; 100–800 m.

59. *Astronia williamsii* Merr. ex C.B. Robinson

Astronia williamsii Merr. ex C.B. Robinson, Philip. J. Sc., Bot. 6 (1911) 214. — **Type:** *Williams 722* (PNH, holo, not extant), Philippines, Luzon, Bataan, Mt Mariveles, March 1904.

Astronia piperi Merr., Philip. J. Sc., Bot. 8 (1913) 354. — **Type:** *Wenzel 222* (PNH, holo, not extant; A, MO, US, Z), Philippines, Leyte, Dagami, 21 June 1913.

Astronia merrillii Elmer, Leaflet. Philip. Bot. 8 (1919) 3091. — **Type:** *Elmer 18430* (PNH, holo, not extant; A, BO, L, MO, US, Z), Philippines, Luzon, Laguna, Los Baños, summit Mt Maquiling, July 1917.

a. var. *williamsii*.

Distribution. Philippines: Mindoro, Batanes, Luzon, Polillo, Catanduanes, Samar, Leyte, Negros, Mindanao (incl. Bucas Grande).

Habitat. Mountain forests, up to 1000 m.

b. var. *ramosii* (Merr.) Maxw., stat. nov.

Astronia ramosii Merr., Philip. J. Sc., Bot. 8 (1913) 343. — **Type:** *BS 10872 (Ramos)* (PNH, holo, not extant; paratype *BS 16524 (Ramos)* in L, US), Philippines, Luzon, Laguna, San Antonio, August 1910.

Distribution. Philippines: Luzon.

Habitat. Not noted.